REPORT RESUMES

ED 013 370 32

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THE FEASIBILITY OF COST/EFFECTIVENESS ANALYSIS FOR TITLE 1,
PUBLIC LAW 89-10. FINAL REPORT.
TECHNOMICS INC., CHICAGO, ILL.
REPORT NUMBER BR-6-1680
CONTRACT OEC-46-001680-1680 PUB DATE 31 JAN 66
EDRS PRICE MF-$0.75 HC-$7.12 178P.

DESCRIPTORS- *FEASIBILITY STUDIES, *EVALUATION METHODS, COSTS, *DISADVANTAGED YOUTH, *EDUCATIONAL FINANCE,

THIS DOCUMENT REPORTS AN INVESTIGATION ON THE FEASIBILTY OF COST EFFECTIVENESS TECHNOLOGY AS IT MAY BE APPLIED TO DECISIONS ABOUT MONEY SPENT ON EDUCATION. THE AUTHORS BELIEVE THAT IT IS FEASIBLE TO APPLY A SUITABLY MODIFIED VERSION OF COST/EFFECTIVENESS TECHNOLOGY TO MATTERS OF EDUCATIONAL EXPENDITURE. THE FOLLOWING PREREQUISITIES ARE LISTED WHICH SHOULD BE MET FOR EVALUATION EFFORTS TO BE SUCCESSFUL--(1) THE EVALUATION SHOULD NOT BE GEARED TO THE CALENDAR, BUT TO THOSE PERIODS OF TIME IN WHICH EDUCATIONAL OBJECTIVES CAN REASONABLY BE EXPECTED TO BE REACHED, (2) THE SCHOOL BUILDING, NOT TITLE I PROJECTS, SHOULD CONSTITUTE THE NATURAL UNIT FOR EVALUATION, (3) EMPHASIS SHOULD BE PLACED ON THE OUTCOMES OF AN EDUCATIONAL ACTIVITY RATHER THAN UPON DETAILS OF THE ACTIVITY, AND TO ILLUSTRATE, THE EFFECT OF AN EDUCATIONAL ACTIVITY DEPENDS ON WHAT THE CHILD ACTUALLY LEARNS, NOT ON WHAT THE TEACHER INTENDED TO TRANSMIT, AND (4) THE EVALUATION EFFORT MUST TAKE COGNIZANCE OF THE CHARACTERISTICS OF THE PUPIL, WHICH CONSTITUTE A VERY REAL PART OF HIS OWN LEARNING ENVIRONMENT. (TC)

technomics inc

ED013370

The Feasibility of Cost/Effectiveness Analysis
For Title I, Public Law 89-10
USOE Contract No. OEC-46-001680-1680
FINAL REPORT

Prepared for
Division of Operations Analysis
National Center for Educational Statistics
U. S. Office of Education

31 January 1966

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A NOTE OF ACKNOWLEDGEMENT

Unfortunately, the real authors of this report may never see it. They are the hundreds of people who so generously gave their time and energy--in many cases deferring other pressing obligations--to talk to us, to take us on visits to schools, to search their files for needed information, and (in truth) to make this document possible.

Without exception, we were warmly received and kindly treated during our field studies. Everything was done to make our large and difficult task as easy for us as possible. Moreover, we were impressed (sometimes almost overwhelmed) by the drive, dedication, knowledge, and compassion that are being expended to promote better educational opportunities for the culturally deprived child. These qualities--though they sometimes seemed to us to be the most striking and apparent features of our field experience--have proven to be the most difficult to capture in this report. We have spoken of "the light in their eyes," of "enthusiasm," of "the spark," but we have been hard-pressed to include measures of those qualities in a scientific report.

At one point, we gave thought to including an appendix that would acknowledge, by name and position, every individual whom we interviewed during the eight months of this study. The idea was abandoned as a meaningless exercise; such an appendix would merely have read like a telephone book. Instead, to capture "the light in their eyes" if only by example, we are including a verbatim transcript of one person's experiences in a Title I project (Appendix B).

In conclusion, to all the real authors: We thank you; we hope you can find yourselves reflected here; we hope you will think that we have gotten things right.

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SECTION I

A GUIDE TO THIS REPORT

A. Organization and Content Summary

During the past eight months, members of the TECHNOMICS staff have been looking for the answer to the following question: "Can cost/effectiveness technology be feasibly applied to decisions about money spent on education?" In pursuit of that answer, we have examined school systems in 12 cities in nine different states. Collectively, those states are responsible for the expenditure of $448,711,554.00 in Title I funds--nearly half of all the money appropriated for that purpose. We have interviewed and gathered information from literally hundreds of people in the 12 cities and the nine state capitals. We have collected data from state superintendents of education, from principals of individual schools, from teachers and librarians, from parents, and from housewives who had served as volunteer classroom aides.

This document is an attempt to record our experiences during the course of this study. We shall describe our findings quantitatively (in terms of statistical results), qualitatively (in terms of observations and "flavor"), and conceptually (in terms of a present and needed structure).

At the outset, let us state the answer we found to our initial question: It is feasible to apply a suitably modified version of cost/effectiveness technology to matters of educational expenditure; furthermore, we can describe the necessary modifications in considerable detail. We can also specify an easily understood tool for program planning and budgeting that will be immediately usable at the local level. The second half of Section I will take up the beneficial results that the combined use of program planning and budgeting and cost/effectiveness analysis can bring about.

Section II, "Perspectives," briefly outlines the social importance of Title I, the unique characteristics of the culturally deprived child, and the evolution of cost/effectiveness technology in the defense area. These perspectives are a backdrop to all that we have done in this study.

Section III, "Statistical Findings," records and explains the actual data generated in our study, and demonstrates how more and better data would be treated. Here we describe the cluster analysis technique and present the results from applying that technique to some of the data we accumulated in the field. As we suggest later, these results can only be indicative--not conclusive. The problems of data collection were severe, but the feasibility of the method has been demonstrated.

Section IV, "Survey Findings," is a panoramic report on our experience in the field. In a sense, we step outside the bounds of our contractual obligation to U.S.O.E. in this section. We were asked to investigate the feasibility of applying cost/effectiveness technology to education; we were not asked to evaluate Title I as a whole. All the work we did in the field was directed toward achieving our primary contractual goal, and was necessary to its achievement. But a more general appraisal of Title I--a description of its overall operation as we observed it--began to "fall out" of the field work. In many respects, our survey findings support and confirm conclusions reached in other studies; in some cases, we feel we have generated a new insight or a new point of view on the effects of Title I. We present Section IV for its suggestive value in reflecting real changes, taking note of success, and implying certain possible modifications.

Section V pursues the subject of required modifications. As suggested above, cost/effectiveness technology must be modified if it is to be applied to education. As a corollary, our survey findings make it clear that educational procedures in the areas of evaluation and costing must also be modified to make that application precise. The direction of the necessary changes is suggested in Section V.

Section VI, "Conceptual Findings" describes in full one primary outcome of this study--a workable tool for program planning and budgeting in education. The value of doing cost/effectiveness analysis will be immeasurably enhanced and the effort of doing it immeasurably reduced if program planning and budgeting procedures have preceded the analysis itself. Section VI recounts the steps by which we arrived at the program planning and budgeting tool, explains and illustrates the details of its operation, and suggests ways in which it might be put into immediate practice at the local level.

Only one other portion of this document--Appendix A--needs to be given special note. One member of TECHNOMICS' cost/effectiveness team worked in a different way in our field studies. In each city, he would step "through the looking glass," and examine the impact of Title I from a different vantage point--from within the ghetto community itself. This approach accomplished several things: it gave us a means of collecting first-hand data on the real impact of Title I on the subpopulation of interest; it gave us a test of the correctness of our information from other sources--i.e., it told us whether the school system and the minority community held common views about Title I results; and it raised certain general questions about the relationships between society at large and the subpopulation of interest in Title I. The results of this special facet of the study are collected in Appendix A.

B. A Working Tool for Cost/Effectiveness Analysis

In our original work statement, we proposed "to work toward... a cost/effectiveness model...which yields positive and fruitful information for social action programs." The results of our work--the model we have devised--has two major components:

1) A method--cluster analysis--that allows its user to associate benefits (i.e., increases in some desired effect) and costs with the characteristics of a learning environment;

2) A matrix--defining and clarifying the structure of the educational possibility space--that facilitates program planning and budgeting, over time, and that specifies and records the evolution of a school system toward some predetermined goal.

Both these components are described at length elsewhere in this document. Here, however, we would like to suggest some of the benefits that may be derived from their use.

Flexibility. One of the first observations resulting from an examination of a number of school systems is that the educational process is characterized as much by differences as by similarities. "Customs" and traditional approaches differ; characteristics of school populations differ; educational needs differ. Moreover, if educational program planning of the kind suggested in this document gains a strong foothold in the educational community, a system's assessment of its needs may be expected to change radically and rapidly. Therefore, as others concerned with program budgeting have noted, "diversity rather than uniformity is needed in procedures. There must be deliberate planning for flexibility..."[1] We believe that the tools we offer here lend themselves to the meeting of this need. They supply a framework within which varieties of plans may be made, but they do not, by their natures, dictate what the content of any plan should be nor the rate at which it should progress. They also lend themselves to replanning or to a readjustment of existing plans, at any time, based on an assessment of existing conditions.

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[1] R. N. McKean and M. Anshen, "Problems, Limitations and Risks of the Program Budget," (RM-4377-RC, The RAND Corporation, Santa Monica, Calif., January, 1965, p. v).

Facilitation of Decision-Making. It has never been easy to make well-supported choices between two or more educational alternatives. Expected benefits were not quantifiable; there was no clear-cut way to specify the real costs of alternatives; and, since the characteristics of the existing educational environment were not well specified, the nature and degree of the change produced by a new program tended to wash out. In the last analysis, support for a particular educational plan had to depend on personal opinion or hope. We believe the tools offered here can provide a better basis for supporting or rejecting any proposed program. First, they allow an administrator to find sets of necessary and sufficient characteristics to produce a change. This can be done with reference to the needs of specific target populations defined by ethnic group, age, geographic locale, degree of mobility, level of attainment, or any other relevant characteristics.

Second, these tools can measure the value of alternative configurations of necessary program elements and, at a more detailed level of planning, of individual characteristics. Suppose, for example, that a school system were trying to choose between two new programs, one a "child development specialist" program aimed at getting reading-readiness materials into the homes of pre-schoolers, and the other a "remedial reading" program at the second-grade level. Or suppose that the choice were between an in-service program to train all teachers in methods of teaching art and a special released-time art program for some pupils. The tools offered here would permit a firmly based and quantified choice between such programs in terms of their expected benefits and ultimate "savings" to the system as well as their initial and on-going costs for implementation.

Third, our proposed techniques can find unnecessary redundancies in existing programs. Money saved by the removal of redundancies in one area could be allocated to expand existing nonredundant programs or to fill gaps in an overall program.

Facilitation of Planning. As we will explain in greater detail in a later section, one of the primary benefits of Title I funds was the spur they provided to planning at the local level. Moreover, we observed that the "best" and most effective planning seemed to occur when the base of planning responsibility was broadest--i.e., when as many people and as many levels of authority as possible were involved in the planning process. We believe that the techniques suggested in this document will assist in both these aspects of good planning. First, the proposed program planning and budgeting matrix provides a means of describing the existing situation in its entirety; it also provides a means of describing the desired goals of the system in identical terms. For the purposes of broadening the planning base, it ensures that everyone involved in planning will have a similar overall picture of the educational system and its goals, and will see more clearly where their areas of responsibility fit within the whole. It encourages planners at all levels to focus on educational outcomes--that is, on the outputs from, rather than the inputs to, the educational system.

Maintenance of Local Control. School districts in the United States are locally established, locally bounded, and locally administered, under the guidance of the state governments. At present, the federal government is undertaking to assist the educational process at the local level, but neither the federal nor local governments intend that "the flag should follow the dollar" in the sense that control of planning and expenditures should also pass to the federal level. We believe that the programming and budgeting tool outlined in this report can help to ensure retention of responsibility at the local level. Essentially, what this tool can provide is a service, offered by the federal government to local authorities, that will allow local planners to express their plans in common terms, support their decisions by firm, quantified data, and justify expenditures on the basis of clearly demonstrated results. Historically, control has been centralized because control at the local level was inadequate. We believe that the techniques we suggest can go far to ensure adequate controls at the local level. They make it simpler to reach certain decisions, to make substitutions, and to implement resource shifts. They also maintain lower-level incentives to seek alternatives, to worry about uncertainties, and to criticize competing proposals. Above all, they make the judgments underlying planning decisions clearly communicable to all system levels.

A Solution to the Problem of Dependence on an Individual. We were repeatedly impressed, as we observed the educational enterprise, to note that the success of a project, or of its embodiment in a particular school, seemed to be vitally dependent on the presence of a single uniquely able person. A project exemplification in one school, supposedly a carbon copy of that project in all other schools, would be outstandingly superior because of the presence of a principal, or a teacher, or a librarian who was exceptional. All other things being equal (whatever "all other things" might be), the difference was one outstandingly able person.

This finding bothered us greatly for two reasons. First, the vitality of a project or school seemed dependent on the continued presence, participation, and leadership of an individual. Second, from a cost/effectiveness standpoint, there is no necessary difference between good and poor teachers, good and poor principals, or even good and poor project supervisors: factors other than quality usually determine costs.

This problem has, of course, been extensively perceived and tackled from a different point of view--from within the context of economic analysis. In examining the differences between one company and another, H. Leibenstein concluded that "...microeconomic theory focuses on allocative efficiency to the exclusion of other types of efficiencies that, in fact, are much more significant in many instances."[1] He called these nonallocative efficiencies "X-efficiency," and further concluded that "although a major element of X-efficiency is motivation, it is not the only element," and that "for a variety of reasons, people and organizations normally work neither as hard nor as effectively as they could."

It was apparent that the factors Leibenstein labeled "X-efficiency" were exactly those we had been associating with the "superior individual" who made the difference in an otherwise identical project. The problem that remained was how to increase and redistribute the effects of X-efficiency. In most cases, the project supervisors or teachers or principals who displayed X-efficiency were products of the local system, subject to the same training and experience as other members of that system. The puzzle was how they got "turned on."

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[1] H. Leibenstein, "Allocative Efficiency vs. X-Efficiency" (American Economic Review, Spring 1966, pp. 392-415).

Leibenstein found it difficult to understand and explain the elusive differences he saw in the operations of otherwise identical companies. With the insights provided by his observations, however, we began to see that the phenomena he had described, as well as the "problem of the individual" that we had noted in educational systems, might both be explained on the basis of certain well-known psychological procedures for modifying behavior. In principle there are a few necessary sequential steps: First, the desired behavior (the outcome) must be exactly specified; second, conditions must be arranged so that it is maximally likely that the desired behavior will occur; when it occurs, it must be reinforced. We deduced that what Leibenstein cited as X-efficiency, and what we had observed to be the phenomenon of the uniquely able were simply random, unplanned occurrences of this sequence. Some teachers or project supervisors had clearly understood the goal to be reached, had correctly (and probably intuitively) specified the steps to reach that goal, had laid out a program that included all those steps in their proper order, and had "rewarded" both themselves and their staff members for the performance of those steps.

Clearly, such occurrences should not be random; more of them should be engineered. The problem becomes to externalize the behavior of these individuals and to ensure that the system itself embodies qualities that will lead to systematic modification of behavior in the right directions.

We believe that the tools derived from our study can help achieve this end. First, they make it possible to define correctly the existing state of the system. Second, they require that all proposed programs be defined in terms of their educational outcomes--i.e., in terms of clearly defined goals. Given a clear statement of where you are and where you want to be, it becomes easier to specify a sequence of operational steps between those two points. Having specified those steps in operational terms, it becomes easier to communicate them to all affected personnel, and to ensure that only those behaviors are reinforced--not extraneous, irrelevant behaviors.

SECTION II

PERSPECTIVES

A. A Perspective on the Social Need for Title I

In 1965, according to reliable and frequently cited figures, there were more than 34 million persons in the U. S. who were classified as "poor." That is, they were living on incomes insufficient to buy goods and services vital to health. Their average income was about 70¢ per day per person for food and other necessities. These 34 millions constitute nearly 20% of the nation's population.

At a level above the poor are the "deprived," whose incomes are above a poverty ceiling, but still short of minimum requirements for a moderately comfortable standard of living. They numbered 35 million in 1965; again, nearly one fifth of our nation.

What, beyond the bare fact of a low income, characterizes these people? First is the fact that 30% of them are non-white--two or three times the ratio of non-whites in the population at large. Further, it should be noted that they are predominantly urban. Only 13% of them live on farms, and 55% of them live in communities large enough to be classed as "cities." Within those cities, they are usually confined to certain sections, occupying houses that fall below normal standards for human occupancy.

To a noticeable extent, poverty can be correlated with the numbers of children in the families of the unskilled, particularly the pre-school children in fatherless homes. For example, in the category labeled "poor," the average male family head aged 22-54 had 3.3 children under 22 and an average family income of $2,253.00. In categories labeled neither "poor" nor "deprived" the average male family head had only 2.0 children and a family income of $8,782.00. Non-white families accounted for 40% of all children under six living in poverty. Since young children need a great deal of parental care, this directly limits a family solution to poverty through gainful employment by the mother--or suggests the great need for special programs for her children. Compounding the problem is that women head almost half the households characterized as "poor." Only 37% of these women worked at all in 1964, and only 13% worked full time most of the year.

These people are not able to afford--and do not even know what constitutes--a proper diet. They do not always practice proper hygiene, and they are almost totally ignorant of preventive medicine. Infant mortality is high, and disease frequently unchecked. They are apt to be very mobile, often moving many times even within a single community as their incomes fluctuate or as their housing is condemned.

As though this picture were not grim enough, research has suggested that in large measure poverty is being transmitted from generation to generation. Common to all of the poor has been a limitation on their opportunities to develop their potentialities to the fullest. This phenomenon has been the result of their family income, educational and occupational background, and in many cases their racial or national origin. The group differences thus produced negate the concept of equal opportunities and the cycle of cultural and economic deprivation is begun. The perpetuation of this cycle poses two grave problems, one of which can be stated in terms of "economic waste," the other in terms of "economic growth."

Clearly, poverty engenders an irrevocable waste of both money and human resources. Let us take a single state as an example. California's percentage of persons categorized as "poor" or "deprived" is lower than the national average, yet 31% of the state's tax budget is spent on health, welfare, public safety, and corrections. Nearly one third of the available state income tax funds are drained away to handle problems that can be directly correlated with poverty.

Another interesting statistic suggests a link between the problem of poverty and economic waste and the possible role of education. California allocates 57% of its income tax funds to education--a remarkably large fraction. But the 31% spent on welfare and prisons--more than half of the amount spent on education--seems to indicate that traditional education has failed, at least with regard to the poverty-stricken and deprived. As the existence of Public Law 89-10 itself attests, education for the culturally disadvantaged needs new thinking and new directions.

The educational challenge that society must meet in terms of its economic growth is described by Charles Silberman in Crisis in Black and White. "The growing complexity of organization and the explosive pace of technology and social change are creating an enormous demand that is without precedent."[1] The need now in society is for highly developed skills, not for the assembly line skills that were the staple commodity of industrialism. In the future, large productive organizations will require many more engineers, mathematicians, operations researchers, computer programmers, and numerous types of technicians.

These needs reverse the concept of education that has been prevalent throughout history. Today, education and knowledge represent the most valuable forms of capital. To be uneducated is to be not only unproductive but unemployable. Thus the task of the school becomes one of turning out not just a few literate men, but masses of people educated beyond the level that previous societies demanded. For this purpose, the school will have to learn how to reach into the ranks of the culturally and economically deprived, where traditional educational methods have failed.

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[1] C. Silberman, Crisis in Black and White (New York: Random House, 1964), p. 224.

B. A Perspective on the Culturally Deprived Child

In an environment such as that outlined in the previous section, what happens to the child?

The deprived child may already have been rejected by the adult world into which he is born; often, the impoverished circumstances of his parents make him unwanted at birth. When the father has not deserted the family, he often is brutal to his children. The burden of merely holding the family together drains the mother's emotional resources. The result is that the child is spoken to infrequently and receives very little attention, guidance, or intellectual stimulation.

At three or four, he ventures out "on the street," where the first thing he learns is that agencies of law and order seem to be unreasonable. If he is found innocently wandering or exploring, he may be suspected of delinquency and misbehavior. If he has money and/or visits stores, he is regarded with suspicion.

After a few years in these conditions and surroundings, he enters school. He is probably totally unfamiliar with books, and may be unfamiliar with the language that the teacher uses. He lacks the repertoire of basic skills that is taken for granted by the middle-class adult. He may not know the names of the colors or the names of the parts of his body; he probably does not know how to tell time; he may never have seen himself in a mirror; he may never have been asked to express his feelings about anything; and he is likely to have only a dim and negative concept of himself as an individual.

The school becomes but one more evidence of his differences--one more stimulus to his frustration, hostility, and alienation. He is tested, and these differences are proven and quantified. The school, in setting about its task of educating this student, attempts to give him remedial work to bring him up to level. More books--more words he does not understand.

There may be a shortage of teachers in his school, and not enough of the teachers the school does have can understand or relate to him. When this is the case, the school falls back on its standby: maintaining discipline. There are rules and regulations that include disciplined regularity and organization, attributes in which this child has relatively little training or experience.

The school is the representative social framework to which the student is exposed. Theoretically, school is supposed to provide useful experiences to which he can later refer, and from which he can later draw appropriate frames of reference that would complement his adaptation to situations, or help him with his solutions to life problems. But the purposes and values of the school mean little, if anything, to him; he cannot relate his world to the school. The prevailing attitude of the older people with whom he has contact is not one that either encourages education or stimulates ambition. For instance, if the child is Negro, the adult Negro males he commonly sees are nine times more likely to be illiterate, and are earning approximately 33% less than the average white male no matter what their level of schooling.

All these factors (common to poverty and deprivation) combine to increase this child's feelings of inferiority and inadequacy and the thus-generated and compounded isolation or hostility results in his leaving school at the earliest possible moment, becoming even more remote and inaccessible in terms of personal or social stability and the common values of our society.

This is the manner in which the cycle has been perpetuated: Poverty to Ignorance; Ignorance to Poverty. And it is this child to which Title I addresses itself. Solving his problems is a formidable but absolutely necessary task, to which there is no quick and easy solution.

One avenue which offers promise is to ask whether or not some of the problem solving tools developed in disciplines other than education are adaptable to determining the effectiveness of spending of the educational dollars. The next perspective (and, for that matter, this whole study) is addressed to that question.

C. A Perspective on the Evolution of Cost/Effectiveness Technology

Cost/effectiveness technology did not simply appear fully developed. It was evolved over many years. The setting for its evolution was in the military establishment.

Each service insisted its needs were unique, and it alone knew best how to meet those needs. (We have found the same view in the educational community, too.) Such items as web belts, jeeps, cooking utensils, small arms, and many, many other common items were designated by different codes and ordered separately. Different accounting systems were used. Personnel selection methods and standards differed. Training methods and standards differed. System design procedures and inspection standards differed. The results were that the services competed with each other unwittingly and in different languages. Inefficiencies were widespread. One service might dispose of items as surplus while another service was adjusting to a condition of shortage.

Eventually it was recognized that the services--collectively--would have to learn how to optimize the use of available funds. (The same problem faces the educational community today--how to optimize the allocation of available funds between different educational undertakings.)

Through the use of system analysis techniques, it was possible for the armed services to do the following four things: first, to identify those elements necessary to each service yet common to all services (record-keeping, providing for health and nutrition, clothing, small arms, transportation, selection of classification, legal and judicial procedures, research and development, accounting, equipment tags, and on and on); second, to identify those elements uniquely necessary to each service (submarines, strategic bombers, or tanks); third, to identify those elements necessary to a particular service but necessarily compatible with similar elements in the other services if successful joint actions were to be undertaken (communications equipment, air cover, transportation); and last, but far from least, to identify sets of necessary sequential conditionalities (e.g., personnel had to be recruited before they could be classified, they had to be classified before they could be given basic training, basic training had to precede specialty training, specialty training had to precede field exercises, and system training and field exercises had to precede military application).

Knowing the common needs, the unique needs, the joint needs, and the necessary sequential conditionalities involved, it became possible to aggregate elements into rational program packages. Having rational program packages, it became possible to institute program planning and budgeting. And having program planning and budgeting it became possible to perform cost/effectiveness analysis, which could then be defined as: the assessment of the effectiveness of expenditures at each stage of the progression through the necessary sequential conditions.

The approach to be taken in education is in many respects very different from that in the armed services. Still, as we examine the applicability of cost/effectiveness technology to the problems of education, much that was learned in the defense setting might be applicable.

SECTION III

STATISTICAL FINDINGS

A. Some Comments on the Field Data

We closed the previous section by describing a developmental path that permitted the armed services to make precise cost/effectiveness studies of their expenditures: first they identified needs and defined a logical event progression; then they prepared adequate program packages; this allowed them to lay out precise plans and budgets; only then did meaningful cost/effectiveness become a possibility.

In point of fact, our field study leapt over all the intervening stages and tackled the problem of doing precise cost/effectiveness analysis in the absence of the necessary prerequisite steps. Much of what follows in Sections IV and V of this report shows just how necessary those intervening steps are. We found:

1) that you can't do good cost/effectiveness studies on an historical basis; there has to have been an adequate prior plan underlying the thing studied

2) that you can't do good cost/effectiveness studies on the basis of estimations and guesses; the means for collecting accurate data must exist

3) that you can't do meaningful cost/effectiveness studies of a portion of an educational enterprise; the effectiveness of the parts depends on the effectiveness of the whole.

Nevertheless, that we have been able to generate so much meaningful information from our marred and spotty data demonstrates that the chosen method--the cluster analysis approach--is both feasible and workable, given the right degree of preparation. In the subdivisions B and C of this section we will indicate what could be done, using the same method, assuming the possession of more and better data.

First, a few matters of detail that will make what follows more easily understandable:

The Sample of Actual Data. In the larger districts we visited, there were in excess of one hundred elementary schools. In the medium-sized districts there were between thirty and a hundred schools.

Our strategy was to look in detail at two schools receiving Title I funds in each district. If the schools were highly comparable, we could explore the possibility that several Title-I-funded schools in a district were comparable and could be considered together. It was rapidly determined that schools within a district were quite different from one another with respect to the characteristics on our list. In order to include each new school it would be necessary to study and describe it in some detail. As a result, we ended up with some two dozen schools. Some of those schools, though Title-I eligible, had very little Title I activity in the Spring semester of 1966.

The "Project" as a Unit for Cost/Effectiveness Analysis. Within educational systems, the project seems to have been the natural basic entity for planning, execution, and evaluation. It was taken to mark the logical boundaries for isolating and defining a manageable unit.

The emphasis in realizing the project was on the details of its internal composition and operation. Although goals and objectives were stated, that process was frequently a formality to be gotten by. Often the project was considered without regard to the remainder of the educational system. One project supervisor might know little about other projects or characteristics of the system; occasionally he was not even aware of their existence. As a result of the isolation of each project from the remainder of the system, much redundancy and waste could be seen in the total system, unperceived gaps existed, and evaluations were often meaningless.

It was usually the case that a project "knew" only which students were affected by itself, and did not know or record what other projects or services or characteristics were impinging on the same students. Under the circumstances, it was difficult to ascribe change to a particular project. Further, no distinctions were made between the student who was impacted by three or four projects and the student who participated in only one.

Comparing projects across districts was totally impossible: projects with the same names were very different in detail; projects with the same goals or objectives were realized in very different manners. Only careful study of the differences and similarities in design, in execution, and in consequences, made the project comparisons comprehensible.

For all the above reasons we rapidly concluded that the project (also sometimes called an "activity" or "service") was not an ideal unit for cost/effectiveness analysis.

The School: A More Meaningful Unit for Analysis. Our field experience soon made it apparent to us that the individual school was a better microeconomic unit of study. The school is an entrepreneurial enterprise, and the principal is the entrepreneur. He has a major influence on the projects implemented in his school--both in number and nature; he runs a successful enterprise or a failing enterprise; he has a degree of autonomy like that of a plant or branch manager; he may be aggressive, or he may be passive and long-suffering; he may scrupulously follow laws, rules, policies, and orders, or he may interpret them flexibly in the light of his own school's needs. For all these reasons, he is a direct determiner of the characteristics that define the educational environment under his control.

The Steps in the Analysis Process. The first step in applying the method we have developed is to describe for a given school what we call the characteristics (attributes) of the learning environment. Characteristics that are present because of Title I are identified; also, existing characteristics that are incremented because of Title I are noted.

When we first started our study, we did not know which characteristics would be meaningful, or related to measures of effectiveness. For that reason we accumulated as comprehensive a list of characteristics as we could generate. We differentiated between primary and derived characteristics. As an example, we recorded exactly which teaching methods were used in a learning environment (out of a large list of possible methods). We were not looking for the use of any particular method, but for several important derived characteristics. For example, one could estimate the willingness of the system to try new techniques, or one could see how informed the teaching staff was about known techniques.

We have since noticed the need for a further distinction between characteristics that are all-pervasive or that have a universal effect on the learning environment, and those that have a limited or specific influence on a part of the environment or on the learning environment of some students and not others. Although of great importance with respect to a given student or group of students in a school, the willingness or reluctance of a particular teacher in a project to try new methods, use new materials, etc., usually will have little general effect on the total learning environment as we have defined it. However, the characteristics of the principal, discussed above, will usually have a great influence on the learning environment. The need for such a distinction between the all-pervasive and the specific characteristic will become apparent when we discuss program planning in Section VI.

The next step is to obtain measures related to change or potential benefit to the educational system, its students, or the community it serves. Just as in the case of learning environment characteristics, we did not know which measures of change would be available or associated with the learning environment. Our solution was the same: we attempted to generate a comprehensive list.

The third step is to associate costs with characteristics and with change measures. This is a difficult (and so far inexact) task. The payoffs of certain changes are related to ultimate measures in proximate fashion. Even though the educational value of some change is readily seen, the chain that establishes the monetary value of that change can be highly complicated. Also, the ramifications of a change can be complex. For example, an effective in-service training program may directly reduce costs related to teacher transfer, absenteeism, and turnover, and may additionally contribute to increased learning, improved average daily attendance, reduced vandalism, and other change measures.

Finally, as described in detail below, the cluster analysis technique is applied to determine which learning environment characteristics form learning environment as we have defined it. However, the characteristics of the principal, discussed above, will usually have a great influence on the learning environment. The need for such a distinction between the all-pervasive and the specific characteristic will become apparent when we discuss program planning in Section VI.

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Finally, as described in detail below, the cluster analysis technique is applied to determine which learning environment characteristics form clusters of necessary and sufficient sets that are associated with desired change. By summing costs in the cluster of characteristics and payoffs associated with related effects, a cost-to-effect ratio is obtained.

B. Treatment of Data by Cluster Analysis

This section describes a model that associates benefit changes (e.g., changes in pupil attainment or some other desired effect) and costs with the characteristics of a learning environment, and describes methods for developing and for studying the model. The conduct of our research--that is, the design of the questionnaires, etc.--was intended to provide a test of this model and its applicability to the educational process.

Defining the Model

The form of the model is as follows:

A learning environment is described as a set of characteristics. Formally, each characteristic is specified as a value (V_i) of an attribute variable (A_i). In the simplest case, the attribute is either absent (0), or present (1), or below some measured value (0), or above that value (1). In the general case, any appropriate scale of values may be employed. Thus, a learning environment can be described as a set of attributes A_1, $A_2, \ldots A_n$, each of which assumes a value from its respective scale. Some environments share a given characteristic while some characteristics belong to one environment and not another.

Likewise, a set of "change" or benefit measures may be enumerated. As do attributes, the change measures have values. Thus, the benefits are described as a set of benefit changes B_1, $B_2, \ldots, B_m$, each B_i assuming its appropriate value. In the simplest case, a change would not have occurred (0) or would have occurred (1). As is the case for attributes, any value set is permissible.

In some cases, the benefit assessed by a particular change measure may become a characteristic of the learning environment when a different change measure is being employed.

Associated with each characteristic of the environment is a cost. This cost is ideally allocatable to each student or each case (an undifferentiated aggregate of students) thus enabling calculation of the cost of a type of learning environment per student or case.

Associated with each benefit change is a monetary value, enabling calculation of the worth of a change.

A technique will be used to form clusters of attributes and benefits, and to determine the degree of association among them.

Since we are investigating existing learning environments as opposed to manipulating a limited number of variables we have enumerated as many potential attributes and benefits as we could.

In an unanalyzed environment, one might expect to find the following: (1) characteristics that tend to produce an environment favorable to educational change; (2) characteristics that are irrelevant with respect to change; (3) characteristics that tend to produce an environment unfavorable for educational change; (4) characteristics that occur simultaneously with other characteristics; (5) and characteristics that when combined with certain other characteristics tend to produce environments that are either favorable or unfavorable to educational change.

However, in an uncontrolled environment, we cannot expect to determine the effects of each potential variable. Conditions preventing this may include the following:

1) There may not exist control groups of adequate size to allow for a meaningful statistical analysis.
2) Some attribute variables are always co-present with other attributes, and therefore their independent effects are indistinguishable. Likewise, some benefits are always co-present with other benefits.
3) Some attribute variables or benefits do not occur in the particular environments we have sampled.

For convenience in analysis of the particular data we have sampled, the learning environments and benefits are redefined as a new set of attributes $A'_1, \ldots, A'_k$ and benefit change measures $B'_1, \ldots, B'_j$, $k \leq n$, $j \leq m$, merging co-present variables and eliminating variables which never occur.

Also, we may want to determine the effects of derived variables--for example, variety of teaching methodology, expressed as a count of methods employed, may be as significant as the particular methodologies used.

The object of cluster analysis is to determine the conditional probability of certain states of various subsets of these redefined change measures given certain states of various subsets of the redefined attributes.

An example of a conditional probability is the expression

$$P(B'_{ia}, B'_{jb} / A'_{1c}, A'_{2d}, A'_{kf})$$

where the second subscript represents the state. That is, one obtains the proportion of cases (however specified) of the variables with certain change measure outcomes, given that these cases are selected only if a certain set of attribute-values is present.

Ideally, the data analysis would be performed at the level of each individual student, yielding a data matrix of the form:

Cases (students)	Attributes $A'_1, A'_2, \ldots, A'_k$	Changes (benefits) $B'_1, B'_2, \ldots, B'_j$
1	$1A'_{10}, 1A'_{21}, \ldots, 1A'_{k4}$	$1B'_{11}, 1B'_{20}, \ldots, 1B'_{j4}$
2	$2A'_{13}, 2A'_{20}, \ldots, 2A'_{k2}$	$2B'_{12}, 2B'_{24}, \ldots, 2B'_{j2}$
3	$3A'_{10}, 1A'_{21}, \ldots, 1A'_{k4}$	$3B'_{13}, 3B'_{23}, \ldots, 3B'_{j4}$
.	.	.
.	.	.
.	.	.

Each row of the above matrix describes the learning environment attributes and changes for a given case. Each cell describes one characteristic of the environment or one change for a given case, represented as the measured value of a given variable, for example, 0. In this example, the learning environment attributes for students 1 and 3 are the same; therefore both of these cases will be included in the same cluster.

Typically, the data available require that the analysis be performed at the level of groups of students, in which case the values are estimated or calculated averages.

Replacing attribute values in the data matrix with an appropriate cost and summing over the attributes present enables calculation of the cost per case for a given type of environment.

A cost table may be prepared giving the costs of characteristics which are essential to the achievement of a given benefit goal as well as to those which are irrelevant, redundant, or even harmful. In addition, a relative dollar value (not an actual dollar cost) may be assigned to costless or undifferentiably costable attributes. There may be many equally reasonable ways of defining such a value. One way to define this value for A_i, say, given a particular setting, a specified goal or set of goals, and constraints upon the planners' choice of attributes, is to take the cost of the most efficient (i.e., minimum cost) subset of all permissible A's excluding A_i, and subtract from this the cost of the most efficient subset of the permissible A's allowing A_i. Clearly, if such a relative dollar value is zero, then A_i is an uneconomical measure to take relative to other alternatives.

As a result of the cost analysis we expect to be able to examine the efficiency of given educational programs. The analysis may sugges alternate means of achieving the same goals, but at lower cost (e.g., keeping only the least expensive of two or more mutually redundant attributes); or it can be used in the broader context of program planning (e.g., selecting the most beneficial programs given a fixed budget); or it may indicate what expenditures are necessary to achieve specified goals.

The costing techniques suggested above should enable the educational planner to evaluate the comparative effectiveness (in terms of cost) of current programs and of alternate programs which may be preferred in the future.

Rather than demand that the cases to be included in a cluster be composed of identical states from a test of all attributes, we will build clusters starting from single attributes and adding other variables as multiple effects are identified.

The working procedure for analysis of available data is roughly summarized as follows:

1) Remove all questionnaire variables that always appear or never appear. Group co-present variables into new aggregate variables. Merge scaled variables as necessary to eliminate zero-frequency or very low frequency components.

2) Sort the aggregated variables into two lists, attributes (A') and benefit changes (B'), assuming for the moment that no variable is both an attribute and a change. Arrange each list in increasing frequency. The variables in the middle of each list are more significant than those at either end of the lists.

3) Prepare a (rectangular) joint frequency survey matrix between the A' list and the B' list. Also prepare similar matrices for A' x A' and B' x B'. If row and column labels retain the orders given in 2) above, the most significant measures of partial correlation (large or small) will be those nearest the centers of the matrices.

It may be convenient to leave the elements of the survey matrices in frequency form, as methods are available for dealing directly with frequencies. Examination of the central areas of the survey matrices may disclose zero joint occurrences; these may be considered reliable indications that such A'B', A'A' or B'B' combinations are not likely to occur.

4) Working from the central areas outward, gradually develop hypotheses to be tested regarding significant co-relationships between groups of variables. This activity must be guided by intuitional appreciation of the particular data at hand.

Applying Data to the Model

Canonical Variables and Hypothesis Testing.

The types of relationships existing between a set of variables (one or more attributes and one or more benefits) are expressible in quantitative terms and in maximum knowable detail by expanding the set of n variables into its Boolean product terms and displaying the frequencies observed for each.

Examples:

$\bar{A}\bar{B} \cup \bar{A}B \cup A\bar{B} \cup AB$

$\bar{A}_1\bar{A}_2\bar{B} \cup \bar{A}_1A_2B \cup A_1\bar{A}_2B \cup A_1A_2\bar{B} \cup \bar{A}_1\bar{A}_2B \cup A_1\bar{A}_2\bar{B} \cup \bar{A}_1A_2\bar{B} \cup A_1A_2B$

etc., the overbars denoting the negation of a component; the cup is the inclusive OR operator, and AND is denoted by simple conjunction. These breakdowns to "canonical" variables yield a set of independent (non-overlapping) variables, so that, for example,

$$(\bar{A}\bar{B}) + (\bar{A}B) + (A\bar{B}) + (AB) = n$$

etc., where the parentheses denote observed frequency, as distinguished from probabilities, denoted P ( ), and n is the number of cases in the study. Some terms of expressions such as those above may be void, because some variables may be defined in a form already logically independent of other variables (for example, variables representing different frequencies of a basic variable on a scale). The observed canonical frequencies may be tested against hypotheses concerning the interactions and overlaps between variables. N-way contingency tables may be used to test various hypotheses about grouped interactions, in which the nth marginal frequency n = 1, 2..., N-1 represents the partial effect of the nth subgroup. Multivariate hypotheses may also be found useful for reinforcing or replacing poor estimates of conditional probabilities between the individual variables.

Information Theoretic Treatment. Well-known information theoretic techniques may be applied to N-way contingency tables and other multivariate analysis schemes. The "information" in a table, in its marginal subtables, and that shared by two or more marginal subtables is very readily computed from published tables of n $\log_2$ n.

The utility of information-theoretic techniques to multivariate analysis arises in several ways. In terms of the proposed working plan, it will be of use in determining how far one should reach out from the central area of the survey matrix (ordered as discussed above) in gathering up additional variables into configurations. Functions expressing various kinds of shared information possess chi-squared distributions; in some computational schemes these calculations may be largely salvaged from the analysis of the survey matrix, and from one scheme to another when variables are added or deleted. Such alterations are more convenient than in the case of conventional chi-squared computations, where means and deviations must usually be recomputed for each new arrangement of variables. Certain ratios of information measures appear also to be usable as arguments for F-tests. Where these methods have no distinct advantages over more conventional techniques, they may still serve as useful cross-checks of inferences drawn by conventional means.

Finally, information theory contains techniques useful for evaluating alternate computational techniques (information per unit of computation), and alternate strategies for seeking significant inferences from the data, taking into account differences in information to be gained in (for example) testing one pair of alternate hypotheses versus testing another.

Using various and somewhat overlapping techniques, we expect to be able to find information about the influence of individual variables on change measures, about the redundancy between attribute variables, about the redundancy between benefit change variables, and about the discriminability of the change measure value set and the meaningfulness of the value sets of individual attributes.

Initial Survey and Compression of Questionnaire Variables. One activity carried out under this contract was to develop the questionnaires used to gather information about the surveyed projects. At the outset, the questionnaire design and the designation of the significant variables had to be quite exhaustive and detailed in order not to miss something unforeseen but significant. This means that when an actual body of data was gathered, some questions returned considerable information but other questions returned little or no information.

This range of informational values arose from two main causes: the limited number of cases (projects) that TECHNOMICS was able to survey in the initial effort, and questions (variables) that turned out to be of generally insignificant value or to be redundant (intentionally or unintentionally) relative to other variables. In the first instances, it is presumed that the variables in question should be retained for further inquiry, and in the second instances the variables in question, other than deliberate plants, should be dropped from further consideration. Unfortunately, it is not always easy to be certain that a question or variable is useless, so that it is always necessary to carry some variables of unknown potential value over to following investigations even when such variables cannot contribute to a current statistical analysis.

A preliminary compression of variables was performed to eliminate low informational variables from the main statistical treatment, setting aside for special treatment and interpretation those that almost always occurred, and merging (where possible) those with relatively low and scattered occurrence into derived variables with sufficient frequency to permit testing of weaker hypotheses with stronger confidence.

This compression also eliminated or absorbed any remaining variables representing redundant cross-check questions that were intentionally included in the questionnaires. In short, an initial complement of variables, inordinately large relative to the number of projects so far interrogated, was compressed to a reasonable and manageable size.

Aside from purely quantitative criteria for compression, derived variables were created with an intent to emphasize relative values, and with the hope of quickly extracting from the data some answers to the more pressing questions facing educators dealing with the disadvantaged. Thus value preconceptions may bias preliminary estimates, and admittedly--given more data than we have now--quantitative informational criteria should dominate the design of statistical models.

Variables were derived with the intent to characterize the major strengths of a project. A project was rated as strong on a given attribute variable if the total number of raw data points it possessed within a given category was above a certain criterion level. The criterion for inclusion in the "strong" group varied from category to category. For a given attribute category, the dividing point was arrived at by judgment based upon inspection of frequencies in the category. In some cases there seemd to be a natural dividing point--the frequency distribution of the category was bimodal. In other cases a cutoff was assumed that would ensure adequate discriminatory power in the division.

The major derived attribute variables representing project strength, which were constructed in this way, are listed and coded below:

A1. Focus on child (identifying and meeting special needs)
A2. Redefinition of learning
A3. In-service training
A4. Administrative staff support
A5. Teaching staff support
A6. Cooperation of teaching and administrative staff
A7. Services
A8. Methodology
A9. Attention to the child in class
A10. Freedom to experiment with teaching methods
A11. Parental involvement
A12. Community involvement
A13. Project planning

Other attribute variables for which no prior assumptions were made include:

A14. Class size
A15. Classroom management techniques
A16. Breadth of program (number of levels of instruction)

A17. Methods of selection of pupils for the project

A18. Racial mix of project group

A19. Racial mix of school

Compression of benefit variables was required and undertaken to a lesser extent than for attributes. Most of the benefits were queried with three possible responses: Positive Change (PC) No Change (NC), and Not Determined (ND). Such a large number of the returns were answered "ND" (Not Determined) that many benefits had too small a control group (NC) to possess any substantial information, i.e., if the ND's were not counted. An assumption was made that any strong change would have been noticed and reported. Therefore we merged the NC and ND responses into $\overline{PC}$ ("not PC").

The benefits retaining any significant information are listed below in an order of decreasing informational content relative to the PC, $\overline{PC}$ split, together with assigned code numbers:

Code	PC	$\overline{PC}$	Description
B1.	9	9	Logical reasoning
B2.	9	9	School performance: Grades, overall
B3.	9	9	School performance: Grades, Title I
B4.	8	10	Counting and ordering
B5.	10	8	Measurement, relative concepts
B6.	10	8	Achievement tests, standardized
B7.	8	10	Parent attitude to education
B8.	10	8	Parent attitude to particular project

Code	PC	$\overline{PC}$	Description
B9.	7	11	Problem solving
B10.	7	11	Speed reading
B11.	7	11	Parent attitude to child
B12.	11	7	Student attitude to school
B13.	12	6	Study skills
B14.	12	6	Word identification
B15.	6	12	Parent attitude to administration
B16.	6	12	Student-family relationships
B17.	6	12	Parent attitude to teachers
B18.	5	13	School performance: Grades, related subjects
B19.	13	5	Visual perception
B20.	13	5	Syntax
B21.	5	13	Parent attitude to school
B22.	13	5	Student attitude to particular project
B23.	5	13	Student attitude to community
B24.	13	5	Teacher attitude to administration

Benefits with PC higher than 13 or lower than 5 were assumed not to possess sufficient information for reliable cross-analysis, and were not coded. Nevertheless the high frequency ones are worth noting. They include: improvement in student self-image and personality, improved peer group relationships, improved interpersonal communication skills, improved speech habits, better attitude toward learning and education, better learning disposition, and increased conceptual power. Most notable were improved teachers' attitudes, which may in turn have strong beneficial effect upon students. These included high returns on improved attitudes toward teaching, toward their Title I project, and toward target population children.

Almost no projects reported improvement in the pupils' abilities to use absolute measurement units or to perform computations. This is probably due to the fact that the projects surveyed put most of their emphasis upon reading and language skills, and relatively less emphasis upon mathematical skills. Also notable was the low reporting of improved attitudes of parents toward their community.

At the time the above list of benefits was compiled and ordered, data on 18 of the 22 projects surveyed were considered to have been sufficiently validated to include in this pilot statistical analysis; subsequently one of these was dropped, so that the examples of statistical inferences given later in this report reflect, and are adjusted for, only 17 projects. Work is continuing on the validation of the data for the remaining five projects.

The Cluster Analysis. The term "cluster analysis" has been diluted to some extent by usage. In this report the term is used substantially in the meaning of Ellson's configuration analysis: Ellson's foundation paper[1] is used as a basic reference, but some clarification of his presentation seems necessary. The following is a brief review together with some proposed variations of technique.

Cluster analysis, or configuration analysis, or simply C-analysis, deals with two main important tasks: (1) to group very similar variables

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[1] Ellson, D. G., "A method for technological predictions," in Quastler (ed.) Information Theory in Psychology (University Microfilm, Inc., Ann Arbor, 1954, pp. 31, 50.)

(i.e., those that co-occur much the same relative to all variables in the data) into clusters for the purpose of reducing the number of variables that must be handled in the statistical analysis while minimizing the loss of information entailed by the reduction, and (2) to discover (and hopefully to measure with confidence) the relationships that exist between variables or clusters of variables.

A few definitions are stated in order to draw some topical distinctions not made very explicit in Ellson's paper.

A distance function D=D(x, y) between two variables x, y is any convenient real-valued function of x and y having metric properties. It might be, for example, the usual vector metric, where a variable is represented as a vector whose component slots correspond to the individual cases (projects, schools, etc.) in the data and whose component values are the case values for that variable.

Two variables x, y are d-connected if $D(x, y) \leq d$. If the threshhold, d, is fixed for all variables and throughout the analysis, then such an x, y pair is referred to simply as "connected."

Any subset of the variables in the data is called a configuration. A configuration in which all members are pairwise d-connected (or connected) is called a d-cluster. A maximal cluster is one that cannot be enlarged by adding any other variable among those identified in the data. In particular, a variable not connected to any other can be regarded as a (singleton) maximal cluster in keeping with the convention that D(x, x) is defined and is zero, hence less than any positive d.

A k-clean configuration is one in which every pair of distinct variables is separated by a distance $\geq k$. In general, $k \geq d$. If $k = d$ then any configuration can be replaced by a clean configuration, obtained by replacing all maximal subclusters by single representative variables, or by "smoothed average representatives." If $k > d$ there may be a third group of variables, those belonging neither to a d-cluster nor to a k-clean configuration.

AND-Clumps. The data analysis will be concerned with the determination of conditional probabilities that specific benefit changes will accrue in a given situation from the combined presence of one or more attributes. A minimal combination of attributes showing a high probability relative to a benefit change will be called an AND-clump for that benefit change, the term suggested by the logical conjunction of attributes required for effectiveness.

A significant AND-clump may be regarded as a new, derived variable V and its relationship to a change benefit B may then be described by the frequency tables, or by conditional probabilities. A significant relationship between such a V and B may be that V is necessary to B, sufficient for B, or even both necessary and sufficient.

In a real environment with many dependently defined variables one would expect usually to find sufficient conditions more often than necessary conditions. A logical expression of necessity would then generally have been expressed as the logical OR of two or more logical products, i.e., of sufficient AND-clumps. If a "necessary" AND-clump or single attribute (as determined by examining the (B, V) tetrad) is found, there may be no need to look for more AND-clumps. However a search anyway would serve to strengthen the confidence in the assumption of necessity.

Significant AND-clumps may occur between distant variables, or between close-distance (d-connected) variables. However, most mutual information is contained in middle-distance variables, e.g., those variables belonging to a clean configuration but that are not too distant, or perhaps, those variables neither d-connected nor k-separated, (depending upon the d and k values adopted). Such variables would be tested first.

An example of AND-clumping, by means of an analysis of canonical combinations of attributes, is given in the section entitled "Drawing Inferences from the Field Data."

When an exhaustive set of alternative sufficient AND-clumps has been found for each benefit change under study, it becomes of interest to find the minimum set of attributes required to ensure, with a desired degree of confidence, those benefit changes relevant to a specific project or situation. This consists of the minimal set of attributes contained in any sufficient coverage of all relevant benefit changes, found by an optimal selection, for each change benefit, of exactly one AND-clump.

In earlier stages of an analysis AND-clumps are ascertained on the basis of overall data, the assumption then being made that specific situations differ only in their relevant benefit changes. Where possible, further breakdown of conditional probabilities between attributes and benefit changes should be carried out to test the homogeneity of these relationships across all situations reflected in the data.

Example 1: Minimal-Cost Grouping of AND-Clumps. In the absence of useful and complete cost estimates for providing attributes, the above "attribute optimization" may be the best one can do. But if costs are available, minimal spread of attributes should be replaced by minimal total cost of sufficiently covering attributes.

In a given situation, the first step is to list the costs of each attribute involved in the various sufficiency sets of AND-clumps for all benefit changes relevant to that situation, then to replace the costs of attributes already known to be present by zero, then to remove from consideration those AND-clumps containing only attributes already present, and finally to select, among the alternative AND-clumps remaining to each relevant change benefit, that coverage minimizing attribute cost. Before a minimal-cost set of attributes is finally recommended, it is prudent to check (at least pairwise) for reinforcements, interference or other non-additive effects that might exist between variables newly "introduced to each other" by this grouping (i.e., that may not have been previously examined).

A brief example follows, where it is assumed that already-present attributes and clumps have been removed ahead of time.

Example: Project 1, Minimal Cost of Attributes

Benefit Changes Required	Sufficient AND-clumps (alternatives)
B1	A1A2A3, A3A4
B2	A7A12, A9
B3	A8A12, A2A3A9

In the locale and under the conditions of this project, the attribute costs are:

Attribute	A1	A2	A3	A4	A7	A8	A9	A12
Cost	0	1	0	2	3	1	4	3

The clump costs are then:

C(A1A2A3) = 1 C(A3A4) = 2

C(A7A12) = 6 C(A9) = 4

C(A8A12) = 4 C(A2A3A9) = 5

The sum of the minimum costs for each benefit taken separately would be 1+4+4=9, and would involve attributes A1, A2, A3, A8, A9, A12. But A8 and A12 can be eliminated by using the second alternative for B3, for a total cost of 5. In this example, minimum cost covering was the same as the minimal attribute covering, although this need not be true.

Example 2: A Hypothetical Cost/Benefit Study. Assume that Project X is being planned, and that it has been determined that six benefits B1, B2, ... B6 would have significant value to the project. Alternative sufficient-condition AND-clumps have been found for the separate benefits; they involve ten attributes A1, A2, ... A10. The separate benefit values are known and the separate attribute costs are known. (These attribute and benefit codes are fictitious, and are not to be related to their use elsewhere to denote actual attributes and benefits defined in the study.)

At least two optimization problems can be imagined:

1) Find the maximum total benefit value, given a maximum budget for expenditure on attributes.
2) Find the minimum attribute cost, given a required minimum total benefit value to be achieved.

When costs are additive and values are additive, the second problem is essentially just the minimum attribute cost problem dealt with in the previous example. Solutions to both of the above-stated problems can be found (or closely approached) by a trial-and-error procedure, computing values and minimum costs for different combinations of benefits. If sufficient combinations are worked out, curves could be plotted on charts to indicate (perhaps only approximately) solutions to these problems for various levels of constraints (i.e., given different budgets or different requirements for value totals), and to indicate ranges in which budget allowances and value requirements are consistent and in which they are incompatible.

If computer assistance becomes available, a program to examine combinations exhaustively and to point out or plot out such feasibility boundaries would not be of exorbitant cost in running time for a problem of this size (namely, 16 variables). For a situation with a somewhat larger number of variables, application of a good search strategy is indicated in order to avoid excessive computation time.

Units of values and costs are arbitrary and independent of each other. Let the ten attributes have the following costs relative to Project X.

Attribute	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Cost	10	9	9	8	2	6	4	4	2	1

These costs are assumed to be simply additive, i.e.,

Cost (Ai + Aj) = Cost Ai + Cost Aj

The following six benefit values for Project X are likewise assumed to be simply additive:

Benefit	B1	B2	B3	B4	B5	B6
Value	10	9	7	6	3	2

The following alternative sufficient AND-clumps were discovered with respect to the benefits:

B1: A1A5, A3A4, A2$\overline{\text{A8}}$A10

B2: A1A4, A7A8

B3: A2, A1A10

B4: A1A2, $\overline{A5}$A10, A4A6A9

B5: A3, A7$\overline{A10}$

B6: A5

The AND-clumps containing complemented factors indicate restraints: for example, one cannot achieve the combination B4, B6 using A1, A5, A10, for the situation cannot logically be provided with both A5, and $\overline{A5}$.

An exhaustive list of B combinations with optimum A's would have $2^6 = 64$ entries. A partial list follows:

B Combination	Value	A's Required	Cost	Value Cost
B1, B2, B3, B4, B5, B6	37	A1, A2, A5, A7, A8	29	1.27
B1 (gives B3 B4 bonus)	23	A2, A10	10	2.30
B2	9	A7, A8	8	1.12
B3	7	A2	9	.78
B4	6	A10($\overline{A5}$)	1	6.00
B5	3	A7($\overline{A10}$)	4	.75
B6	2	A5	2	1.00
B1B2 (B6 is then a bonus)	21	A1, A4, A5	17	1.23
B1, B3	23	A1, A5, A10	13	1.77
B1, B4	16	A4, A6, A9, A10	17	.94
B1, B5	15	A3, A4	17	.84
B1, B6	12	A1, A5	12	1.00
B2, B3	16	A2, A7, A8	17	.94

B Combination	Value	A's Required	Cost	Value Cost
B2, B4	15	A7, A8, A10	9	1.68
B2, B5	12	A7, A8($\overline{\text{A10}}$)	8	1.50
B2, B6	11	A5, A7, A8	10	1.10
B3, B4	13	A1, A10	11	1.18
B3, B5	10	A3, A10	10	1.00
B3, B6	9	A2, A5	11	.82
B4, B5	9	A3, A10	10	.90
B4, B6	8	A4, A5, A6, A9	18	.45
B5, B6	5	A5, A7	6	.83

There are 20 triple combinations to be checked, 15 quadruples, and 6 quintuples remaining to be listed. Some other "bargains" were:

B2, B5, B6	14	A5, A7, A8	10	1.40
B1, B3, B4, B5	26	A2, A3, A10	19	1.37

Other complications may arise in attribute costing and benefit valuation. The above example, while including interference effects of combining attributes to achieve benefits, does not include these other costing and valuing complications.

Variations on the costing problem of attributes that might be encountered include attributes with no cost, attributes whose costs are shared with those of other attributes (e.g. cost $(A1 + A2) < \text{cost } A1 + \text{cost } A2$), and even costs that may be partially recovered if a certain benefit or benefits are achieved.

Variations of the benefit valuation problem that might be encountered include reinforcement effects (e.g., value (B1 + B2) $>$ value B1 + value B2) and interference effects (e.g., value (B1 + B2) $<$ value B1 + value B2).

Both attribute costs and benefit values may be expected to vary in time, and to vary from one locality or project to another.

Example 3: Value of an Attribute in a Given Situation. The previous example dealt with attribute costs and benefit values, and with the task of maximizing benefit value when operating on a budget, or of minimizing the cost for a proclaimed value goal. The task was defined in such a way that no relationship was required to hold between cost units and value units; indeed, they could have been simply ratios among their own kind (no units).

If costs and values are stated in the same units (e.g. dollars) or, at least, on a common ratio basis, then it is possible to speak of values in the "net" sense: "gross value" minus "cost to achieve." Further, as will be shown, it is then possible to assign (net) values to individual attributes relative to a given situation. Attribute values are useful for making quick estimates of gain or loss to a project due to changing attributes when a complete minimal-cost analysis (such as in Example 2) is not desired or not feasible.

One way to look at "attribute value" (given a common ratio basis or common units for attribute costs and benefit values) is to note that for all benefits in a situation there is a minimal-cost set of attributes which will achieve them, (Ai may or may not be included) and there is another minimal-cost set if Ai is prohibited from use. The latter cost is subject to more constrained choice, and therefore will exceed or be equal to the former cost. This non-negative cost difference may be regarded as the value of Ai. Applying this value formula to A1 of Project X, re all benefits, we find:

Value (A1) = cost (best set without A1) - cost (best set)
= cost A(2, 3, 4, 5, 6, 7, 8, 9) - cost A (1, 2, 5, 7, 8)
= 44 - 29 = 15

Note that the initial Ai cost is accounted for in this formula.

There is one situation where this definition does not make sense. Note that A5 is required in order to have benefit B6 at all: No set without A5 exists that will yield B6, so the formula above cannot be applied to A5. Moreover it seems only equitable to allocate the value of B6 directly to A5, adding it to any other A5 value source (which must be among the other five benefits). The value of A5 happens to be: value (A5) = value (B6) - cost(A5), for A5 is not included in the best A-set which will achieve B1, . . . , B5, and the initial cost of Ai must be deducted once.

The general rule for attribute Ai, whether uniquely required for some benefits or not, is now clear: Take the first formula value with respect to all benefits for which Ai is not required, and add to it the value of the benefits for which Ai is required.

If conjunction of variables is a necessary condition (only one AND-clump but more than one variable in it) the B-value involved may be assigned to each necessary variable.

Computer Assistance in the Analysis. One of the contributions made by the Ellson paper[1] was a systematic method for semi-automation of the data analysis. The paper appeared in 1954, a time when the type of machine assistance available economically to people (outside of govenmental hard-science and military establishments) was typified by unit record equipment and manually operated, edge-notched cards. Consequently, methodology still had to be based upon careful consideration of the labor involved in the analysis.

Today, with the wide availability of powerful computer assistance in several forms, much more can be economically done in a data analysis. The concepts of d-distance and k-separation, for example, can be examined with respect to a given large body of data by trying many values of d and k. Configurations and clusters can be formed with respect to subsets of the data, and these data subsets can be subjected to homogeneity tests; formerly, perhaps, only the total data set could be analyzed because of data volume and time and manpower limits imposed upon the project.

If there are 100 variables in a set of data there are 4950 pairs that can be formed, around 80,000 triples, etc., with a total of $2^{100} = 10^{30}$ possible combinations of all numbers of variables. Therefore, even with large-scale computer assistance it is important to plan the analysis of a body of data, i.e., to account for the likelihood that only a few hundred (or at most a few thousand) data combinations will show significant relationships.

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[1] Ibid.

The form of computer assistance that seems the most useful in data analysis with a large number of variables is a conversational system in which the analyst can guide the analysis with his heuristic judgment toward the more significant relationships between variables. This man-machine oriented service is available from time-shared computer services who install remote consoles at users' locations. But the analyst may want to make some inquiries that involve a rather large volume of computation and printout. Therefore a conventional batch-processing service is an important backup to a conversational facility. The analyst can then continue to ask for quick-look responses from the conversational system while long-run processing is going on, in a more economical way, somewhere else.

C. Drawing Inferences from the Field Data

This section illustrates the methodology used to analyze relationships between attribute and benefit variables. Some examples are given, based on the data obtained from the twelve local districts. These examples were chosen to illustrate the variety of logical relationships between variables. Because of the small numbers involved they are not to be regarded as being more than suggestive.

The following simple notation will be adopted for displaying the "causal" relationships between attributes and benefits. Let A be an attribute variable composed of a single attribute or any logical function of several attributes, e.g.,

$$A = (A8\ A9\ \overline{A10}) \quad \text{or} \quad A = (A7 \cup \overline{A8}\ A9)$$

Let B be a benefit change variable also composed of a single benefit or any logical function of benefits. An overbar denotes the logical complement of the variable or function beneath it. Then $(B, A) = \begin{matrix} n_1 & n_2 \\ n_3 & n_4 \end{matrix}$ is a representation of the frequencies of entry into a table of the form

	$\overline{B}$	B
$\overline{A}$	n_1	n_2
A	n_3	n_4

The tetrad $\begin{matrix} n_1 & n_2 \\ n_3 & n_4 \end{matrix}$ for distinct logical connections can be rapidly spotted and interpreted after some practice.

In cases of partial correlation several significant patterns appearing in a tetrad are given below, where if an n_1 appears, it represents a fairly large integer, and where a zero represents either zero or an integer that is much smaller than any n_i in the tetrad.

(B, A) = $\begin{matrix} n_1 & 0 \\ n_3 & n_4 \end{matrix}$ suggests the following statement:

The presence of A is necessary but not sufficient to ensure B.

(B, A) = $\begin{matrix} n_1 & n_2 \\ 0 & n_4 \end{matrix}$ suggests the following statement:

The presence of A is sufficient but not necessary to ensure B.

(B, A) = $\begin{matrix} n_1 & 0 \\ 0 & n_4 \end{matrix}$ suggests the following statement:

The presence of A is both necessary and sufficient to ensure B.

(B, A) = $\begin{matrix} 0 & n_2 \\ n_3 & n_4 \end{matrix}$ suggests the following logically equivalent statements:

The absence of A is sufficient to ensure B, but not necessary,

The presence of A is necessary but not sufficient to block B. (I.e., A is a necessary blocking factor but it may be blocking only in conjunction with some other factor.)

(B, A) = $\begin{matrix} n_1 & n_2 \\ n_3 & 0 \end{matrix}$ suggests the following logically equivalent statements:

The absence of A is necessary to ensure B, but not sufficient.

The presence of A is sufficient but not necessary to block B. (I.e., A by itself will block B but there may be other variables or combinations not including A that can block B.)

$(B, A) = \begin{matrix} 0 & n_2 \\ n_3 & 0 \end{matrix}$ suggests the following logically equivalent statements:

The absence of A is necessary and sufficient to ensure B.

The presence of A is necessary and sufficient to block B.

B and A are mutually incompatible.

The following tetrad patterns would not occur among the higher-information variables:

$$(B, A) = \begin{matrix} 0 & n_1 \\ 0 & n_4 \end{matrix} \text{ or } \begin{matrix} 0 & 0 \\ 0 & n_4 \end{matrix} \text{ or } \begin{matrix} 0 & n_2 \\ 0 & 0 \end{matrix}$$

can occur only when B always occurs;

$$(B, A) = \begin{matrix} n_1 & 0 \\ n_3 & 0 \end{matrix} \text{ or } \begin{matrix} n_1 & 0 \\ 0 & 0 \end{matrix} \text{ or } \begin{matrix} 0 & 0 \\ n_3 & 0 \end{matrix}$$

can occur only when B never occurs;

$$(B, A) = \begin{matrix} 0 & 0 \\ n_3 & n_4 \end{matrix} \text{ or } \begin{matrix} 0 & 0 \\ 0 & n_4 \end{matrix} \text{ or } \begin{matrix} 0 & 0 \\ n_3 & 0 \end{matrix}$$

can occur only when A always occurs;

$$(B, A) = \begin{matrix} n_1 & n_2 \\ 0 & 0 \end{matrix} \text{ or } \begin{matrix} 0 & n_2 \\ 0 & 0 \end{matrix} \text{ or } \begin{matrix} n_1 & 0 \\ 0 & 0 \end{matrix}$$

can occur only when A never occurs.

By checking high-information single attribute variables against high-information benefits, strong tendencies toward necessary and/or sufficient patterns may become apparent. Such variables would be included in further analysis of their joint effects with one or more other attributes, since apparent effects of single variables may actually occur only in combination with other variables (or their logical complements).

Some examples of single attributes suggesting significant effects are given below: Examining the effect of A8, "strong methodology," upon B3, "school performance in Title I subjects," we find that (B3, A8) = $\begin{matrix}4 & 0\\ 4 & 9\end{matrix}$. We conclude, subject to further analysis, that "strong methodology" appears necessary but not sufficient to insure B3.

Likewise, considering the effect of A9, "more attention to the child" on B3, we find (B3, A9) = $\begin{matrix}8 & 1\\ 5 & 4\end{matrix}$, suggesting that A9 is necessary but not sufficient to ensure B3.

Examining the effect of A11, "high parent involvement on B7, "parent attitude toward education," and on B11, "parent attitude towards child," we find that (B7, A11) = $\begin{matrix}6 & 1\\ 3 & 7\end{matrix}$ and (B11, A11) = $\begin{matrix}6 & 1\\ 4 & 6\end{matrix}$, so that "high parent involvement appears necessary but not sufficient to ensure "improvements in parent attitudes" (B7, B11).

The following example illustrates a case in which an effect apparently due to one attribute value was also due to a second value. Consider A16, "level of program instruction." This variable includes the following values:

R = remedial level

E = enrichment level

Examining the effects of R on B4, "counting and ordering," gave (B4, R) = $\begin{matrix}1 & 6\\ 6 & 4\end{matrix}$. This suggests that the absence of the remedial level in a project is sufficient but not necessary to ensure B4.

However, looking at other logical combinations we find that (B4, $E\overline{R}$) = $\begin{matrix}7 & 4\\ 0 & 6\end{matrix}$, which suggests that enrichment projects without a remedial level are also sufficient but not necessary to ensure B4. The case (B4, ER) gave $\begin{matrix}3 & 10\\ 4 & 0\end{matrix}$, which suggests interference when both levels of instruction were present. The remedial level alone (B4, $\overline{E}R$) gave $\begin{matrix}5 & 6\\ 2 & 4\end{matrix}$, which, while more favorable than both together (B4, ER), is not as favorable as (B4, $E\overline{R}$), enrichment alone.

The following example illustrates an examination of various logical conjunctions of a set of attributes believed to contribute to a given benefit change in order to discover a minimally sufficient AND-clump for that benefit change.

The three attributes and the benefit in this example are:

A8: Improved methodology,

A9: Freedom to experiment,

A10: More attention to child,

B4: Counting and ordering.

In the B4 case, A8, A9, and A10 are selected for examination on the basis that:

$$(B4,\ A8) = \begin{matrix} 4 & 1 \\ 3 & 9 \end{matrix},\quad (B4,\ A9) = \begin{matrix} 3 & 4 \\ 3 & 7 \end{matrix},\quad (B4,\ A10) = \begin{matrix} 5 & 4 \\ 2 & 6 \end{matrix}$$

the first showing possible necessity, but strong effect in any event, the other two showing positive relevance, one tending toward the sufficiency pattern. Combinations of variables are computed until a decision can be made concerning the AND-clumping of A8, A9, and A10, beginning with (for example) the 2-combinations:

$$(B4,\ A8\ A9) = \begin{matrix} 5 & 3 \\ 2 & 7 \end{matrix}\quad (B4,\ A8\ A10) = \begin{matrix} 5 & 5 \\ 2 & 5 \end{matrix}\quad (B4,\ A9\ A10) = \begin{matrix} 6 & 4 \\ 1 & 6 \end{matrix}$$

The pair lacking A8 seems to be about as good as pairs involving A8. Examination of $\overline{A8}$, A9, A10 and A8, A9, A10 to check the effects of known $\overline{A8}$ and known A8 upon (A9 A10)-sufficiency yields:

$$(B4,\ \overline{A8}\ A9\ A10) = \begin{matrix} 7 & 9 \\ 0 & 1 \end{matrix}\quad (B4,\ A8\ A9\ A10) = \begin{matrix} 6 & 5 \\ 1 & 5 \end{matrix}$$

Thus the apparent sufficiency of A9 A10 is actually due to the presence of A8. Since, moreover,

$$(\mathrm{B4},\ \mathrm{A8}\ \overline{\mathrm{A9}}\ \mathrm{A10}) = \begin{matrix} 6 & 10 \\ 1 & 0 \end{matrix} \quad (\mathrm{B4},\ \mathrm{A8}\ \mathrm{A9}\ \overline{\mathrm{A10}}) = \begin{matrix} 6 & 8 \\ 1 & 2 \end{matrix} ,$$

the triple combination is superior to pairs A8, A10 and A8, A9. Since $(\mathrm{B4},\ \mathrm{A8}\ \overline{\mathrm{A9}}\ \overline{\mathrm{A10}}) = \begin{matrix} 7 & 8 \\ 0 & 2 \end{matrix}$, there is insufficient evidence to assume that A8 is sufficient without either A9 or A10. In the absence of further evidence it must be assumed that A8, A9, A10 is a minimal sufficiency AND-clump with respect to B4.

The previous examples may not exhaust the information we could gain by systematic exploration of the data. However, the effort required is not warranted in view of the small number of data sets presently available. The tetrad notation, representing tables of frequencies for the four logical conjunctions of two variables (or functions of variables), appears to be a simple and convenient way of describing logical interactions. If a computer is available to assist in the data analysis, it is a small matter to augment the tetrad printouts with conditional probabilities, computed as appropriate ratios of numbers in the tetrads.

SECTION IV

SURVEY FINDINGS

A. The Impact of Title I

Although our research team was not in the field to investigate or evaluate Title I, it was almost unavoidable that we should be impressed by many apparent results of the Title I programs and should come to hold some convictions about the impact of the program as a whole.

First, it did not seem to us that Title I had yet had much effect on its primary target--the disadvantaged children themselves. We saw changes in administrators, changes in teachers, changes in the organization of the educational process, and changes in attitudes and objectives within the school system. But so far, most effects on the children have been indirect--glancing blows whose real impact was felt elsewhere. Partly, this is explainable on the grounds that the first implementation of Title I was hurriedly planned. Many projects came off of "want lists," or out of file drawers; projects were not fully coordinated into comprehensive programs, and their direct educational benefit was not assured.

Remember, however, that our investigation covered only the Spring semester of 1966. Theoretically, this was to have been the first "full semester" of Title I operation. In fact, some projects ran for as little as three weeks. Staffing problems kept others functioning at less than full scale. Supply problems caused some to operate very differently than had been intended, forcing the use of entirely different curricula, etc. A few projects never got off the ground at all. Further problems arose when projects went into the evaluation phase, as we shall explain at considerable length below. Suppose, for example, that evaluation had been modeled on a project description, but that the implemented project had not conformed to that description. Or suppose that a project had been in operation for as few as 15 school days, but an evaluation had been attempted anyway (!).

In such cases, evaluation becomes scientifically equivalent to palmistry or crystal-gazing; there may have been some direct benefits to the children that were not measured--that were, in fact, not even measurable--under the circumstances.

On the other hand, we spent hundreds of hours observing classes at work, talking to principals, reading memos and reports and letters from parents, listening to anecdotes and experiences related by teachers. If we are not deluding ourselves--and none of us was equipped with rose-colored glasses--we saw real evidence of change and growth as a result of Title I. We saw a clear trend toward better communication, better understanding, and better organization in educational systems. If most of the impact of Title I has been on teachers, are not teachers themselves a relevant target population? If administrators have been changed by Title I, are they not in the best position to pass those changes on to the rest of the system in the form of better policies and goals?

What follows is a record of some of the evidence on which we base these convictions. We believe we saw quite a few swallows; time and experience will determine whether they make a summer.

Impact on School Systems. In general, the need to direct Title I funds toward a particular subpopulation of students has brought about a considerable re-evaluation of the needs and capabilities of the target youngsters. There had always been voices within the school systems, of course, that recognized these children's special needs and supported a belief in their capabilities. In many instances, such individuals had been operating "shoestring" or "pilot" versions of programs that were expanded under Title I so that they became more visible throughout the whole school system. Teachers who had a previous interest in the special needs of target population children were often the first to volunteer for Title I positions. These and similar forces served to augment and extend an awareness of and concern for the special problems of Title-I-eligible subpopulations.

Another influence of Title I was the freedom it provided to systems to try something new. The "something new" was not often clearly innovative in an educational sense, but it was new to the system in question, and required new thinking, new planning, new insights. We have observed such projects to have a marked leavening effect on the whole school in which they were implemented, or on a whole school system. Where freedom to innovate existed within a system--freedom to try new ideas, experiment with and modify them, and even abandon them if they did not work--we saw the effects manifested in teacher attitudes, pupil attitudes, etc.

The requirements of Title I also meant that affected school systems had to sharpen their skills at planning. They had to learn to state the objectives of their programs in ways that promoted effective evaluation; they had to determine space, supply, and personnel needs accurately; they had to provide for the replacement of classroom teachers who moved into Title I programs; they had to incorporate adequate means of information dissemination and in-service training as part of the preliminary plans for the projects; they had to make each project fit together to form an overall program reaching as many of the target children as possible in an effective and organic whole.

In a similar manner, affected school systems were compelled to improve their evaluation skills, for evaluation was a requirement under Public Law 89-10. Moreover, to a greater degree than had ever been required before, evaluation had to be made an integral part of program development.

In actual practice--as one might suspect--these improvements in planning and evaluation were not uniformly and completely worked out. Some planning and evaluation difficulties will be covered later in this section. However, the general trend of Title I's impact was toward better planning and evaluation.

The Title I program contributed, also, to a new freedom to question traditional goals. In a sense, we may view Title I as an iconoclastic force in education. If a traditional goal of an educational system had been "to teach children to read," the system was now forced to recognize that, in regard to the children who were the particular target of Title I efforts, this goal had not been attained, and what is more, that the traditional means for attaining it were not functional. Perhaps a program set up especially to reach the bulk of the cultural underachievers should have different goals. At the very least, different methods and approaches should be employed to reach whatever goal was set. Further, some interesting side effects of Title I programs began to be noticed. For example, increased parent involvement, arising naturally out of the response to a Title I program, might force an awareness that parent involvement itself was a worthwhile goal to be achieved in connection with programs that had previously been entirely school centered. This is but one example of the kind of insight that has produced a new sensitivity and adventurousness within the milieu of successful Title I environments.

Finally, in school systems where we have observed that Title I has been most successful and has produced the greatest degree of change, there is noticeable a marked increase in communication--both up and down within the system, and outward between the system and the community.

Inpact on Administrators. School administrators--that is, the people primarily responsible for setting policy for their schools and districts--have been affected by the tendency of Title I to call traditional educational goals into question. As one superintendent put it, "The body of knowledge will double in the next eight years. I don't know what we should be teaching! Maybe the most valuable thing we could do for them is to teach them to cope with change--that's one thing we can predict with certainty that they could use."

Some administrators have also taken a look at their traditional management practices from an entirely new vantage point. In some school districts, Title I funds were used primarily to provide more of what the districts were already providing; in other districts new ideas were tried out. Where new ideas were tried, it seemed to us that a dialogue was established between administrators and teachers, a dialogue that led at least some administrators to re-evaluate their management practices in the direction of involving in basic planning the people who would need to carry out the activities. Where this was done, teacher morale was very high indeed.

Title I has also forced some school administrators to re-evaluate the role their schools should play in the community. For the first time, school systems have worked in close liaison with other agencies in behalf of an overtly similar objective--to raise the level and the standards of a disenfranchised or disadvantaged sector of the community. The success of the Headstart program and its close relations with the school systems is a case in point. The Neighborhood Youth Corps was also highly visible as a contributor to the success of Title I programs in some localities. Our interviewers never heard these youngsters described in any but highly laudatory terms; sometimes, it must be granted, the descriptions carried an overtone of surprise at the industry and agreeableness of youngsters who had previously been considered hard-core cases of disdain and disregard for either work or school.

As well as re-examining their own role in the community, some administrators have come to a new appraisal of the role of the community with regard to the school. For reasons that go beyond Title I and Public Law 89-10, new voices are speaking in the community--and in many cases these new voices are addressing their remarks to the prevailing educational system. Perhaps partly because of the new insights gained from the impact of Title I, school administrators are showing a readiness to listen.

As a corollary, some administrators are beginning to re-evaluate the attitudes and roles of parents. It is still not impossible to hear the opinion expressed that "the parents just don't care what goes on in the school," but further questioning usually reveals that this opinion only exists where the speaker himself has had no contact with the home--direct or indirect. On the other hand, a number of Title I projects were specifically designed to promote parent involvement, or produced increased parent contact as a subsidiary effect. As part of the evaluation process, for instance, some parents were asked to fill out questionnaires on their attitudes toward the projects and the results they had seen. One or two quotations will show the quality of many of these responses:

> "I can't explain in details, but to me it mean a great deal to have a person interested in my troubles and problems and that goes without saying, my children's problems...please excuse me for knowing what I want to say."[1]

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[1] The quotation is exact; the omission of the word "not" seems both touching and significant.

> "Because us parents at work, especially working at B_______, we go early to work and late at night from work we don't know what really goes on at school, so I praise Mr._________'s work to bring this report to us parents."

As a result of comments like these, increasing numbers of teachers and administrators are expressing the opinion that parents do care, and that they can be motivated to cooperate more closely with the school.

Another change we noted in school administrators was a new attitude toward their teachers. Many teachers who had been relatively inconspicuous in the traditional classroom showed amazing gifts for flexibility, improvisation, creativity, and drive when they turned to teaching a Title I project. Administrators were able to see and appreciate these qualities, and the new insight has led some to take another look at their whole teaching force, both those teachers involved in Title I, and those in the regular classrooms. In the course of our interviews in the field, we asked each administrator what he thought to be the major factor in the "success" of his Title I program. Most frequently, the answer had something to do with the quality of the personnel--and that quality was often described in glowing terms: "The skill of the teachers"; "the teachers were experienced, articulate, open, and responsive"; "The teachers' interest and dedication"; "the teachers have been given the freedom to be creative." This sample of responses could continue at great length in the same vein.

Finally, Title I seems to have had some impact on the progress of racial integration in the schools. The federal guidelines were clear on the question of integration, and some Southern school administrators welcomed this opportunity to promote a degree of integration they had long believed it necessary to achieve. The clear intent of the guidelines provided a lever that the administrator could use to encourage local acceptance of integration in return for federal aid to local education.

Impact on Teachers. The greatest impact on the teacher seems to have taken the form of a renewal of enthusiasm and real pleasure in teaching. Not only do most Title I teachers describe their experience in these terms; the other teachers and administrators concur--and do so with a sparkle in their eyes that makes the fact undeniable. In many cases, working on a Title I project seems to have had a power to engage the imaginations of these teachers and set them to working with more energy and freedom than ever before. In city after city, we were told of the hours of extra time and "volunteer" labor these teachers put into preparing special materials or conducting special projects beyond the normal scope of the classroom. For example, delivery of supplies was often a problem during the Spring semester of 1966. Many Title I projects and classes were set up and running for a number of months before any supplies were delivered from the publishers and manufacturers. We were told of several instances in which entire curricula were devised and supported by materials hand-made in the teacher's "free" time.

But enthusiasm was not measurable only by donated hours of work. It was reflected also in an appreciation for different techniques, different approaches, and a different kind of child than many of these teachers had been accustomed to before. As an example, take one teacher whom our interviewers questioned. This woman, a long-time teacher in a large city, had always worked with special classes of children identified by the school system as "gifted." Her pupils' I.Q. scores had ranged between 135 and 150, and their achievements matched. When the Title I program was in the planning stage, this teacher attended a meeting about the remedial reading project, and was asked if she would be interested in volunteering as one of the special reading teachers. She replied that she would not, because she felt that her skills were being best used in her present position. Nevertheless, at a subsequent time her name was "included on somebody's list" (as she rather ruefully puts it), and she was asked again if she would accept the Title I post. This time she consented, and she soon found herself in an educational milieu very different from the one to which she had been accustomed. She now says that she will never go back to her old job, and her animation when she describes the progress of her pupils--some of whom are overcoming two or more years retardation in reading--makes it clear that she means it.

This degree of enthusiasm carries other qualities along with it. For instance, these teachers seem to be paying increased attention to children as individuals. Partly this stems from the opportunities provided by a lowered pupil-teacher ratio. But it also may be due to a real change in attitude, particularly toward those pupils who had seemed less responsive or interesting before. Increasingly, these teachers are recognizing that disadvantaged pupils have real capabilities--hampered though they may be by faulty preparation and past failures--and that those capabilities can be tapped by creative teaching. Most important, these teachers feel a real responsibility to promote learning, and not just to present a certain block of material in a certain time. They are aware that the children toward whom Title I programs are aimed have persistently failed in an environment characterized by simple "presentation," and that it is the purpose of Title I to halt that failure.

Teachers are also increasing the degree to which they communicate with one another. Before Title I, many teachers interacted only with their own classes of 25 to 30 pupils. Now, especially in cities whose Title I programs are extensive and many-faceted, a special reading teacher and an enrichment teacher may take a small group out of the class for an hour a day; the classroom may be visited by a music teacher, an art teacher, and a teaching librarian; the classroom teacher may herself be part of a teaching team. All these changes mean that the teacher gives and receives more feedback about the needs and attainments of her pupils. The inclusion of teachers in the planning of some Title I programs and the increase in in-service training programs for teachers have also brought teachers together more frequently and in more meaningful ways.

All the things just mentioned--the visiting teachers, the special classes, the team teaching--serve to demonstrate another impact of Title I: adherence to the concept of the "wholly contained classroom" seems to be diminishing. Some projects had this effect as an explicit goal; in others, it has been an accidental by-product, peripheral to the stated intentions of the project. But in either event, the net result has been to reduce the number of cases in which a single teacher is required to play all the educational roles with respect to a group of pupils.

Impact on the Public. The impact of Title I on the public at large is less easy to pinpoint, and obviously less easy to assess. Nevertheless, it is worth reporting that in one city a survey was made of the vote on a local school bond issue after a Title I project had caused intensive home visits to be made in some areas. In the precincts most heavily affected by this project--that is, where the greatest number of home visits had been made--the percentage voting in favor of the bond was significantly greater than in adjacent districts where that Title I project had not been instituted.

Impact on the Pupils. Hard data on academic achievement under Title I is to be derived from the evaluation reports. We are concerned here with an impact of a different sort--the impact on pupils' attitudes toward school and toward education in general--particularly as it relates to them personally. Vast numbers of these children had previously experienced nothing but failure in school. Some are now finding out for the first time that they can learn, and what is more, that they can enjoy it. An example from our field experience gives the flavor of this change. In one city, our interviewers' visit to a special "learning laboratory" for the primary grades was protracted throughout an entire afternoon. The learning laboratory concept was unique in this school system (in fact, it was one of the most innovative projects we saw during the entire study), and the teacher was both enthusiastic and loquacious. After observing several classes in action, the interviewers and the teacher seated themselves at one end of the room and continued their discussion. (By this time, the last bell had rung, and the school day was officially over.) Gradually, by ones and twos, children of various ages slipped quietly into the room, peeked at the teacher (whose attention was distracted by our conversation), and started playing and working with the various instructional materials and games with which the laboratory was stocked. Finally, one of the interviewers asked if this was an after-school class that might need the teacher's attention, and she replied, "Oh no. But they love this place! Sometimes I can't get them out in time to lock up in the evening. Those boys with the badges and caps are in the safety patrol, and they are supposed to be at their posts, but they slip away and come in here instead. I probably ought to send them out, but they really get a lot of benefit from the materials here, even though they think they're playing."

Impact on Parents. Like the impact on the community at large, impact on parents is difficult to assess specifically. Nevertheless, the quotations already given (see page 68) are not unrepresentative of some changes that can be seen as a result of Title I. Some parents are learning that the school cares more about their children than they had thought it did. (Along these lines, let us note in passing that we never heard a single negative remark about home visits. Wherever they are made, and whoever makes them--be it teacher, school nurse, or principal--they seem to have been beneficial. We asked about home visits in every interview, and we sometimes got responses indicating that their usefulness was doubted; but it turned out that these doubtful responses came only from places where no home visits had been made!)

Some parents are also learning that the school will listen to their ideas and requests, and that they can be of help, both through action and attitude. In all probability, these were already prevailing conditions--it is not necessarily the schools' attitudes that have changed, but the parents', as a consequence of improved communication. Nevertheless, an increase in rapport, from whatever cause, is a benefit to both.

B. Evaluation: A Few Drawbacks

Surely one of the most innovative and beneficial aspects of Public Law 89-10 is its requirement that the effect of these monies on the educational process be measured or evaluated at periodic intervals. However, a number of factors conspired to make the initial evaluation difficult to accomplish. As time goes on, many of the problems to be listed here will surely be alleviated simply by practice and the passage of time. However, always bearing in mind that the evaluation requirement is in itself praiseworthy and in the best educational and economic interests of the schools and the government, it may be helpful to report some of the evaluation difficulties encountered during the first implementation phase of Title I.

First, through lack of initial understanding, some school systems fell into semantic traps. For example, though the guidelines seem to be clear on this matter, some school systems interpreted a request for the use of "standardized testing" to be a demand for the use of "standard instruments." If standard instruments were not available, or if they were not content valid, there was no real alternative to designing special tests related specifically to the stated objectives of the project. Having fallen into the semantic trap, however, some school systems either used an inappropriate measure to evaluate a project, or--what was worse--restricted their range of possible projects to those measurable by existing instruments. In either case, possible benefits were lost.

Some systems seemed also to be struggling against a kind of "diffuse anxiety"--rational or irrational. In some cases, it was feared that funds would be cut if fabulous results were not reported in the evaluations. In other cases, there seemed to be contradictions or disparities between the requirements laid down by the federal government and the requirements that emanated from the state level; attempts to resolve these disparities had some strange results on costing and evaluation.

In a sense, the law itself--though certainly of great benefit to participating school systems--carried some inherent booby traps that caused trouble:

In the first place, the normal calendar governing congressional action is markedly out of synchronization with the school planning calendar, which forced unrealistic time limits on the planning phase of the programs. The funds were appropriated by Congress in November 1965--months after the schools had finished planning their regular Spring curricula--and suddenly there was a great deal of money to be spent very quickly. Without adequate time to plan, adequate and integrated evaluation could not be insured.

Inadequate time and information also meant that plans were not as complete and correct as they needed to be. Statements of project characteristics and objectives were sometimes vague or contradictory. Staffing and equipment requirements were imprecise. Communications between planners of different facets of a program were insufficient and untimely.

Then floods of simultaneous orders began raining on unprepared publishers and manufacturers. The resultant shortages and back orders delayed the start of some projects and caused others to depart from their prior descriptions.

To fill Title I teaching positions quickly, large numbers of teachers were assigned away from the regular classrooms. Soon the administrators discovered that they had merely moved the personnel problem into another budgetary bracket. Regular classroom teacher positions were just as hard to fill with adequate personnel.

If a school system elected to take extra time for planning--time to make sure that they constructed a good, comprehensive, cohesive program with sensible and meaningful evaluation designed in--then the system might find itself called upon to evaluate before a single project had gotten under way. Even if planning was hurried, the first evaluation was required by law after a very short running time for some projects--in effect, before the projects were producing enough to be amenable to accurate evaluation.

Finally, just as things seemed to be taking shape, came the cutback in the level of funds--a very demoralizing event in many instances. Programs had to be cut back before any evaluation was possible--no matter how tentative. Without a chance to evaluate, it was almost impossible to make good judgments about the proper areas in which to trim a program.

Of course, many of the problems just cited are of the sort that will disappear in the natural course of events. They occurred because a novel program came into existence in a remarkably short space of time. But each of them contributed in some measure to the evaluation difficulties.

The federal guidelines themselves may be viewed as contributing in part to the drawbacks of the first evaluation. By their nature and orientation, they focused attention on projects rather than on educational objectives, fostering the view that each project was independent of its fellows in the system's total program. In actuality, many projects were highly interdependent, both in content and in the population on which they impinged.

The guidelines sometimes fostered "tricky" thinking at the local level. Some systems, anticipating the necessity to produce a separate evaluation for each separate project, created "portmanteau" projects.

"We have a single project to promote better reading," they might say. "Of course, it has some subsidiary elements--'Art and its Relation to Reading,' 'Libraries to Read In,' 'Cultural Enrichment to Promote More Reading,'--but it's just one project, so we only have to evaluate academic achievement in reading."

In some ways, the guidelines also fostered inadequate evaluation design for instance, by requesting data in a form that was inappropriate.

One common example was the failure to differentiate treatments of data based on different design methods. Thus, where pre- and post-test design was used, data were requested as though an experimental-control independent-groups design had been used; the request was made for the mean and standard deviations of the pre-test scores and the mean and standard deviation of the post-test scores. Retrieving and using individual difference scores in one case we tried resulted in finding change which had not been realized.

The guidelines were not the central problem, however; on the whole, many school systems simply lack the necessary technical sophistication to design a meaningful and complex evaluation plan. Costs, for instance, are almost never thought of as being a part of the evaluation process.[1] Evaluation design is not considered early enough in the planning process. And the real nature of a relevant change measure is not clearly understood.

For instance, project objectives may be stated in terms that are simply not amenable to measurement--for which no meaningful measures are possible. Suppose, for example, that the objective of a project has been stated to be that of "educating the whole child." Clearly, that is an achievement impossible to measure.

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[1] The problem of costing pervades the problem of evaluation, but we have chosen to tackle it as a separate issue later in this document (see Section V).

Some objectives require new measuring instruments--either new in fact, or new (and unfamiliar) to the school system. A project that has as its objective the ego development of Title-I-eligible children requires a highly refined measurement tool; it is doubtful whether really adequate tools presently exist to measure this quality.

Some objectives have different realization periods, yet all were required to be measured at the same time. Take, for example, the disparity between "months gained in reading achievement" and "number of Title I pupils obtaining gainful employment." The two measures are not temporally commensurable. In fact, it may be the case that the most relevant measure of a project is only obtainable long after the treatment has been given. Projects that aimed to provide cultural enrichment are a prime example; success in training a child to assimilate the manifold offerings of a culture is only observable during the course of many years.

Most damaging to all, however, was the use of inappropriate evaluation procedures. Related measures were commonly tested as though they were independent; the possibility of multiple causation was ignored in testing gains; control groups were almost never used to provide either baseline or comparative data. Projects were allocated to schools on bases absolutely unrelated to evaluation design needs.

C. Evaluation: The Many Benefits

Having noted at some length the flaws and stumbling blocks that marred this first evaluation, we must return to and reinforce our major point: "One of the most innovative and significant aspects of Public Law 89-10 is its requirement that effects be measured at periodic intervals." In spite of initial difficulties, the requirement for evaluation promises to have a profound--and profoundly salutary--effect on the educational process as a whole.

First, that requirement has focused attention on the need to plan. In other sectors of the economy--business, industry, defense, etc.--little is undertaken without predictive planning. A manufacturer, for instance, would be very unlikely to produce a new item without some assurances that the market would support it and that the net result to his company would be profitable. In education, on the other hand, much is based on the hopeful presumption that "music can't hurt; art can't hurt; a health program is bound to do a little bit of good." But no attempt is made to determine just how much these things help, or whether some other program, no more costly, might not help more.

Knowing in advance that they must judge their program on this basis, educators are being forced to take a hard look at their overall programs, at the individual projects of which they are comprised, and at the objectives toward which they are aimed. They are beginning to frame in advance the questions they will ask about these projects when they near completion; they may make some initial mistakes (cf. the "educating the whole child" problem), but they are unlikely to repeat mistakes of that kind very many times.

Educators are also learning from experience that they must plan for flexibility and change within projects. By the time evaluations were due; some projects differed materially from the form in which they were initially described; personnel had been augmented by volunteers who enlisted along the way; supplies and materials were substitutes for those originally specified. Still, the projects were all too often evaluated in terms of their postulated, rather than their actual characteristics. However, if modification is allowed for in the plan, evaluation can be a meaningful exercise even though projects alter radically during their existence.

There is another important aspect of the need for flexibility. Evaluation plans should provide for the review of programs already in existence. Businesses tend to drop products for which there is no longer a market. Many schools continue to offer programs that train or educate students in obsolete skills, methods, and knowledge.

The sudden access of large amounts of money, to be spent in short order, is in itself a spur to creative and hard-headed planning--at least in the long run. Without being at all charitable, one could write off the first semester's experience with Title I as a valuable learning period. The benefits of the experience will become apparent in subsequent years, as educators put together more comprehensive and cohesive programs based on the lessons learned in the first trial by fire.

Second, educators are being forced to direct their thinking toward the ultimate problem of program evaluation. This means that each project must have clear and workable objectives, clearly described; benefits to be derived from it must be appropriately stated; and measurement of those benefits must be made by an accurate and relevant tool. Whatever the results of the project, if the evaluative technique is appropriate and correctly undertaken, those results will shortly become obvious. In and of themselves, obvious results are likely to promote better programs over the long run.

Third, evaluation can readily become a tool that fosters the trial of new educational means and methods. If it is possible to measure--exactly and specifically--the effects of an instructional approach, it becomes much less important that the approach have the weight of tradition behind it. The traditional assumption that a teaching method was effective may have been, indeed, the only evidence for that effectiveness. In an environment of correct evaluation, all teaching methods are equal before the same judge--achievement of measurable good results.

Finally, as an outgrowth and culmination of the three benefits discussed above, the need to evaluate encourages a rethinking and restating of educational objectives. Educators are beginning to realize that they cannot aim an artillery barrage of subject matter at a specific target and let fly; they will have to demonstrate that the materials are being accepted and assimilated to a greater degree than before. They will have to address the real problems of the real culturally deprived child, not a stereotype from which a trail of false conclusions follows.

We believe we have seen evidence that many educators are responding to these new forces. If that observation is correct, the legal requirement to evaluate is largely responsible.

D. Expected Things Not Found

It is difficult--perhaps impossible--to embark on a field investigation without carrying along a few preconceptions about the things that will be found or observed. As our "Second Interim Report" noted, we started out with some assumptions about the nature of our study that had to be amended as that study progressed. By the same token, we began with the assumption that certain aspects of educational practice would be highly visible in the field, and we found that they were not there.

For example, we found few instances in which recent developments in learning theory (hypothesized and tested under laboratory conditions) are being put into experimental practice in the classroom. It is apparent that these interesting new methods--the sort published in technical journals of learning--do not penetrate very far into the educational hierarchy.

Two examples will suffice: We saw little evidence that plans were being made to use individual automated learning or programmed instruction devices, materials, or procedures, and only one case where such materials were being used (rather badly).

The second example has to do with the planned use of high-frequency responses as reinforcers of low-frequency responses. Knowledge of this phenomenon was not seen at all.

Most surprising was the absence from the classroom of any extensive use of programmed instruction. This development in educational practice, which has been both experimentally and empirically tested, is generally regarded as a valid and important breakthrough. It has been widely publicized, and a number of instructional program sequences exist in published form. Yet it is conspicuous by its absence from the classrooms we investigated. In the one instance of its use that we did find, it was serving as an ego builder rather than an instructional tool per se; extremely easy programs were presented--ones in which the children were able to get all the right answers--to provide some positive reinforcement and help break long-standing failure syndromes.

We could not determine any single reason for the absence of programmed learning, but two responses to questions posed in the field are suggestive:

On the one hand, we were often told that "existing materials are unsuitable for children who function at levels so far below their presumed grade." That is, the program steps were found to be too large, or the level of verbal skills necessary to follow the programs was beyond the capacity of these children to understand without a great deal of individual preparatory work with the teacher--a thing impossible in large classes. If correct, this estimation indicates that a serious gap exists in the range of published materials available. Given appropriate materials, there is no suggestion that they would not be used, nor that they would be found ineffective in dealing with the educational problems of these children.

On the other hand, many teachers simply commented that "no programmed materials were supplied to us." It is possible that more uses of programmed learning would have been seen if more teachers had ordered their own equipment and supplies.

This brings us back for a moment to the question of coordinated planning. We found that one of the most prominent indirect benefits of Title I was the increase it brought about, in a number of instances, in the degree to which all levels of the school hierarchy became involved in the planning of educational projects--in the establishment of educational goals and objectives. This extension of the planning function was not universal, however. Though the classroom teacher might feel that she was given considerable freedom in setting up her curriculum, she was often constrained by decisions made at other levels.

For example, one of our field workers asked the teacher of a special reading class about the supplies she had ordered. "Oh, I didn't order any supplies," she replied. "They just came! It was just like Christmas when I opened all those boxes!" This teacher was greatly pleased at the abundance of materials she had been given, and went on to point out that her class was better equipped than any of the regular classes--all through the bounty of Title I. It occurred to the interviewer afterward, however, that her experience had been "just like Christmas" in another respect--she had no notion at all what she was going to find in those boxes. No account had been taken of her own preferences, or her own style of teaching, and in great measure the content of her curriculum was not self-determined, but was determined willy nilly by the things she found in the boxes. Another example of the same phenomenon was a classroom that contained two large "listening posts" with headphones for about a dozen children. The interviewer asked the teacher how she incorporated the listening posts into her project work, and she replied "Oh, those things? I never use them! They were just here when I came into the classroom on the first day of the semester; I've never even turned on the switches. I wish they'd take them out, because I sure could use the extra space."

Another factor notable for its absence from programs we examined was any evidence of strong leadership from teacher-training institutions. In some instances, consultants from local schools of education were called in to give pre-service or in-service lectures to Title I teachers, but that seemed to be about the extent of any coordination between the classroom and the university in regard to Title I programs. It seems that the schoolroom does not look to the School of Education as a source of assistance and guidance on operational problems.

Finally, we noticed a prevasive lack of any in-service training for administrative personnel and regular classroom teachers. At the worst, this omission produced a complete lack of understanding and rapport among the school administration, the regular classroom teachers, and the teachers engaged in Title I projects; nobody knew why the Title I teachers were there, what they were supposed to do, or how they intended to set about doing it. All they knew was that a teacher--assigned to the school for mysterious reasons by the central offices--was requesting classroom space in an overcrowded school, selecting particular pupils for special instruction based on unknown criteria, and generally upsetting normal routines. At best, in cases where other personnel had gleaned some information about the Title I programs from other sources, this lack still meant that administrative cooperation was not based on an optimum amount of information about the program's objectives and techniques.

E. Major and Minor Themes in Title I Projects

At the time of the submission of TECHNOMICS' "Second Interim Report" (November 1, 1966), only half of the 12 test cities had been visited by our data-gathering teams. Data and impressions of the six completed cities had not yet been analyzed by the project team as a whole. It was only later, as all the evidence was gathered together--that we began to note a remarkable unanimity and uniformity from city to city in the objectives of all programs. On the surface, this may sound like a contradiction of our previous contention (see the "Second Interim Report") that Title I projects were characterized by extreme diversity. Diverse they were, in method, scope, technique, and individual classroom practice. But in terms of project titles, project "summaries," and overt aims, it began to seem to us that they rang changes on a remarkably small number of themes.

The dominant theme, recurring in every city but one--sometimes in several variations within a city--seemed to be reading. A great many programs had as their central focus a remedial reading project, or a project intended to prevent reading retardation. Counterpointing this main theme were several categories of auxiliary or subsidiary efforts:

Projects that increased the general experience level of pupils. Here we included projects such as the "learning laboratory" previously mentioned, projects for developing language arts, projects providing cultural enrichment, "student achievement" centers, and projects focused on art, music, or dramatics.

Projects that emphasized individualization of instruction. Here we grouped all the projects that lowered the teacher-pupil ratio, either by actual reduction of classroom size, or through devices such as team teaching, teacher aides, "three for two," or "one added to three."

Projects that increased individual attention to some pupils. Included in this category were projects that provided individual tutors, classes in English as a "second language," etc.

Projects that attempted to meet special psychological needs of Title I pupils. Not only as separate classes and projects ("charm courses," for instance, and courses in ethnic history), but also as an auxiliary effort in classes having other primary objectives, efforts were being made to improve the ego development and self-concept of these children. The introduction of counselors at the elementary school level also had much the same objective in view.

Projects that increased school integration. Here we included all the projects for pupil transfer, redistricting, open enrollment, "triad" schools, "magnet" schools, educational parks, and community schools.

Projects that increased health, hygiene, and welfare. Obviously, this category included all physical education programs, lunch programs, clothing programs, provisions for medical, dental, and nursing care, and the like.

Projects that increased educative resources. Libraries, librarians, and librarian-teachers were prominent in this category, along with special projection equipment, supplies, and supplemental books.

Projects that increased communication between the school and home. Projects in this category primarily used special visiting teachers or lay aides indigenous to the community. In addition, some projects required that the project teacher or school nurse make home visits.

Projects that better prepared all personnel. In this category fell in-service training, attendance at conferences, the use of consultants, and visits to other districts.

Projects that increased administrative heft. This was a very minor theme--in fact, hardly more than a grace note; but a few cities had instituted projects calling for the hiring of additional (usually non-teaching) vice-principals and supervisors.

At first it somewhat surprised us to see the projects we had been breaking down into atomistic fragments (the attributes or characteristics) falling into so few classes. The process of categorizing all projects, however, turned out to be a very insightful exercise: First, it demonstrated that looking at projects by name can be misleading (when you can group together two such diverse things as the teaching of ethnic history and elementary school counselors, it becomes apparent that names mean little); second, it emphasized that the objectives of a project or program were its most significant aspects.

Taking that idea a step further, we saw that even the stated objectives of a project could be misleading--that what was most important was to look at the output side, rather than the input side, of the project "black box." To illustrate--suppose that a project had as its stated objective "to teach the basic patterns of music through rhythmic dance"; suppose further that the children showed little increased comprehension of musical patterns, but that many of them--as a result of the freedom and self-expression dancing allows--began to participate in their regular classrooms, express feelings, exhibit an improved self-image, etc. The project might have been evaluated as a failure in terms of its stated objectives, but it could show clear benefits in terms of another fundamental operation or objective of the educational enterprise.

We also began to get a new perspective on diversity within projects. Diversity might only reflect individual differences--individual styles, approaches, and procedures that were ways of taking steps toward a fairly small number of operational goals. Perhaps if school systems cultivated that kind of diversity they could reap a harvest of real, meaningful innovation. For example, suppose that your operational objective is to infuse basic reading skills in second graders. As long as you remain constantly aware of your real educational goal, you can experiment with a wide array of techniques. Are the little girls interested in playing house and cooking? Hold cookery classes for second graders, and make the cook book the reading primer. Do the children like field trips? Take them on a field trip every day, and use advertising billboards and street signs for drill in phonics. Any procedure *that produces the learning of reading* is a legitimate procedure. (The procedure that produces the *most* learning will be determined by effective evaluation.)

Finally, we considered the following questions: "Do the categories we have discerned constitute an optimum taxonomy for classifying educational objectives? Are there others we have not seen? Are there, perhaps, others that the schools themselves have not seen?" The answers to these questions led us to the conceptual findings that will be described in Section VI.

SECTION V

PREREQUISITES TO COST/EFFECTIVENESS ANALYSIS IN EDUCATION

A. Some Basic Evaluation Parameters

In the course of describing our survey findings, we outlined a number of faults and flaws that arose to plague the evaluation process. By implication, the content of that section foreshadowed much of what we will include in this listing and discussion of basic, necessary evaluation parameters. Here we stress that unless the following important factors are taken into account when evaluating Title I programs, the evaluation will be unreliable and incomplete:

First, reasonable periods of time must be allowed for change to occur. One must remember that many of the children in the target population are the victims of an inability to learn arising not out of a lack of innate intelligence, but out of self-defeating attitudes. These children will not progress until their attitudes have changed. Time allowances must also be made for payoffs that do not show up immediately. It is probable that the real impact of Operation Headstart will only be evidenced when large numbers of children in the third and fourth grades do not begin to exhibit the failure syndrome.

A second major factor, and one not totally unrelated to the time allowance factor, is that there are certain sequences through which the pupil must go before he can attain some educational goals. Children cannot, for example, learn to read with comprehension material containing words they do not know; word knowledge and vocabulary must precede reading with comprehension. Even massive assaults on educational needs will fail if aimed at the wrong stage in the educational sequence.

A third major factor influencing evaluation in many districts is the fact that several Title I projects may impact on the same students, making it impossible to assess the impact of any one project, *per se,* without the use of special controls or special data collection procedures.

Fourthly one must recognize that it is a semantic trap to equate "education" with "schooling." Much that is educative goes on outside of the school. Home and peer groups are potent educators of attitudes, for example. Clubs and churches can be, and often are, important influences in the lives of children. In one district we visited, a church was conducting remedial reading sessions during the summer months with reportedly fabulous results. These were the same children who had not been able to learn to read in the local school. What was the difference? In the church school, the children were paid small amounts of money for having learned. The more they learned, the more they earned. And the later results of a Title I special reading program in the local school were very gratifying to the reading teachers there, who were--as it happened--unaware of the church program. (As you can see, this is also an example of the impact of multiple educative efforts on a single child.)

The effort to evaluate a single project in a given district can be, at times, an almost useless task. To comprehend this, take any project as an example; say, a remedial reading program. Now examine the extreme variations in the implementation of that project in the different schools within the district. The project is not only interpreted differently in different schools, but it finds itself imbedded in a different milieu at different schools.

As consequence of the foregoing factors, we feel that the following prerequisites must be met for evaluation efforts to be successful:

1) The evaluation should not be geared to the calendar, but to those periods of time in which educational objectives can reasonably be expected to be reached.

2) The school building, not Title I projects, should constitute the natural unit for evaluation.

3) Emphasis should be placed on the outcomes of an educational activity rather than upon details of the activity. To illustrate, the effect of an educational activity depends on what the child actually learns, not on what the teacher intended to transmit.

4) The evaluation effort must take cognizance of the characteristics of the pupil, which constitute a very real part of his own learning environment.

B. Measures of Change

The problems of measuring change are likely to be around for some years to come. People are going to disagree on what constitutes movement toward educational excellence and, therefore, will disagree on the tests to use and what to use them on.

Fortunately, this fact need not deter any school district from effectively utilizing a cost/effectiveness technology. Tests can be selected or devised to assess attainment of the effects specified as desirable by the individual district (even in the absence of a more general consensus). In addition, many measures besides tests are pertinent for the measure of educational effectiveness. Sometimes fortuitous measures of effectiveness will offer themselves by chance. In one city, a "visiting teacher" project was conducted at some schools, but not at other, comparable schools. The visiting teacher's job was to call on pupils' homes, meet parents, answer questions about school, etc. Later, a school bond issue was put to the voters. In areas where the visiting teacher project had been in force, significantly more votes were cast in favor of the bond issue than in other areas where no home visits had been made. Such "lucky hits" are the exception, however; many new measures will be needed to assess the impact of the school not only on the pupils but on educators, parents, and the community.

In many cases, the failure to have data arises from the failure to collect them. If no data have been collected, it may be because no one has asked what changes might reasonably be expected to occur as a function of program operations.

Three suggestions can be made about the selection and use of change measures:

1) First and foremost, the measures selected or devised should be relevant to the objectives sought. Should a lunch program be instituted with the objective of helping children learn better, the measure of its success should be on how much more was learned when children were fed than when they were not fed. A count of the number of lunches served is no measure of the project's effectiveness. (However, if the objective of a lunch program is to provide lunches--taking the provision of adequate nutrition to be a legitimate function of the school--then the number of lunches served is a direct and relevant measure.)

2) Second, the measures should be appropriate to the stage of the educational process at which the pupils now stand. It was a mistake, for instance, when one district used fourth-grade-level reading tests on fourth-grade pupils who were reading at a second-grade level. If any gains were made by these pupils, they were undiscoverable by the test used.

3) Measures of change can be misleading when based only upon amount learned. The important thing to measure is not "amount learned," but "improvement in the rate of learning." As an illustration, note the lower curve on the graph in Figure 1. Improvement is reflected by the degree to which that curve can be pushed up toward the line that represents normal progress. Characteristically, the deprived child is a marked underachiever, no matter what his I. Q. level might be. Real success is evidenced when he begins to achieve at a rate commensurate with his ability.

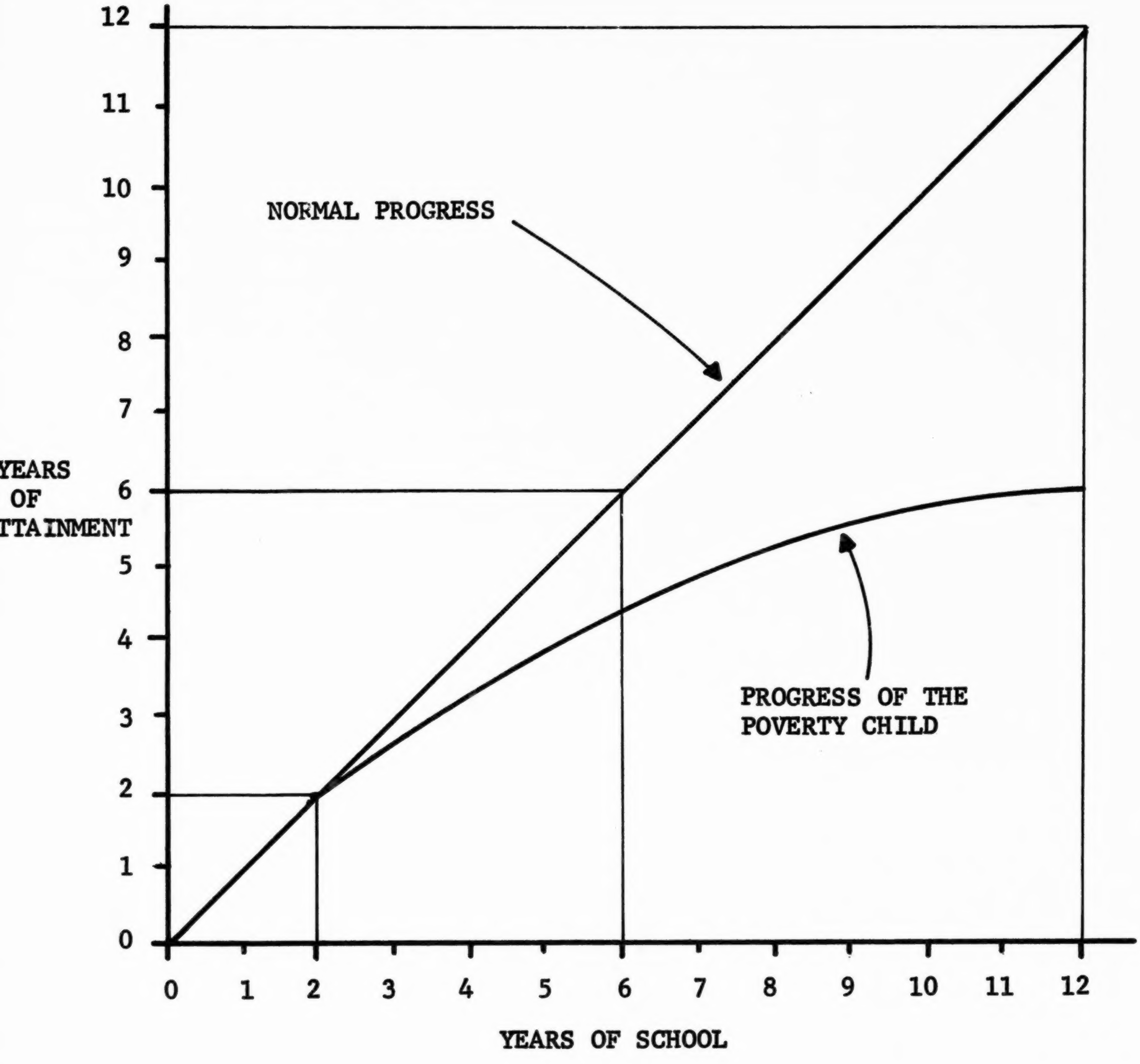

FIGURE 1: REPRESENTATION OF NORMAL ATTAINMENT RATE AND ATTAINMENT RATE CHARACTERISTIC OF THE POVERTY CHILD.

C. Needed Improvements in Evaluation Procedures

Looking at projects in the survey cities, we sometimes felt that real benefits were being obscured or not discovered because inappropriate evaluation procedures had been used. If educators are to learn how to get through to the deprived child through experimentation, they must make certain that their evaluation procedures help rather than hinder them.

One way is to make certain that the statistic used is appropriate to the evaluation design. Where more than one variable is involved, some form of multivariate analysis should be used. The evaluation should not just pretend that each variable is independent of every other one.

A second way is through the use of control procedures. It may seem cruel to withhold from some children an activity deemed beneficial, but doing so may be the only way to determine whether that activity is indeed beneficial or worthwhile.

A third way is through the development of new measuring devices in areas in which no suitable measures now exist. How should one measure parent-school interaction? We have seen no measures in use, but we have been told that this is a very important factor in influencing children. We are reminded of the story about the boy who lost a dime in the middle of the block at night; he started to look for it down at the corner under the streetlight, and when asked why, he replied, "because that's the only place there is any light!" If education needs some streetlights in the middle of the block, they should be installed there.

A fourth way, mentioned earlier in this section, is to be sure to collect all data that are available--including those not previously collected because their relevance as a measure was not perceived.

D. Needed Improvements in Cost Data

To associate costs with benefits due to Title I infusion of money across the states, a number of requirements must be met.

First, there must be established methods of cost accounting that will yield comparable cost figures from one district and state to the next.

Second, there must be a uniform policy on how to handle the indirect costs incurred in the management and supervision of projects.

Third, there must be comparable policies on the amortization of capital and equipment outlays. Associated with this is the need for knowledge of any delay between the expenditure of funds for equipment and the introduction of the equipment into the learning environment. If money is expended in January for a projector that does not arrive in the classroom until April, no pro rata costs can be assigned to the months of January, February, and March.

Fourth, care must be taken to use actual costs rather than budgeted costs; the two can be quite different.

Fifth, it should be recognized that Title I expenditures are inextricably bound up with other expenditures such as the normal school budget, and supplemental funds received from state sources or philanthropic agencies. By assigning only the highest paid teachers to Title I projects, for example, a district could afford to hire more teachers with its existing salary funds, thus producing a benefit not directly traceable to Title I funds. It seems necessary to include an appraisal of all non-Title-I cost data, as well as direct Title I costs. Just as educational variables interact, cost variables also interact.

Sixth, accounting procedures should be established that will make it possible to allocate costs to individual pupils. This is especially needed when a number of projects impinge on different pupils to different extents.

One additional note on costs: the practice of recalling unexpended funds leads to last minute--and sometimes not well-planned--purchases of equipment of dubious educational value (such as electric typewriters for secretaries in Title-I-eligible schools). It is our conviction that most educators would spend left-over amounts on educational activities were they permitted to hold the funds past arbitrary fiscal deadlines.

As the foregoing paragraphs make clear, schools are going to have to begin using some new and different procedures if they are to accomplish adequate cost accounting. The following flow diagrams and accompanying text suggest the kinds of things that will have to be done.

Figure 2 shows the general flow of a possible method for cost retrieval. Each step in Figure 2 could be expanded into much greater detail; for example, Figure 3 is a more detailed view of a single step of the general flow diagram. Even Figure 3 could be broken down into more steps that would produce a more refined result in terms of specifying absolutely exact costs. It should not be assumed that any particular level of detail is prescribed for all cases. (Obviously, it would be impractical to cost a $1000.00 project at such a level of detail that the costing process would itself cost a great deal of money.)

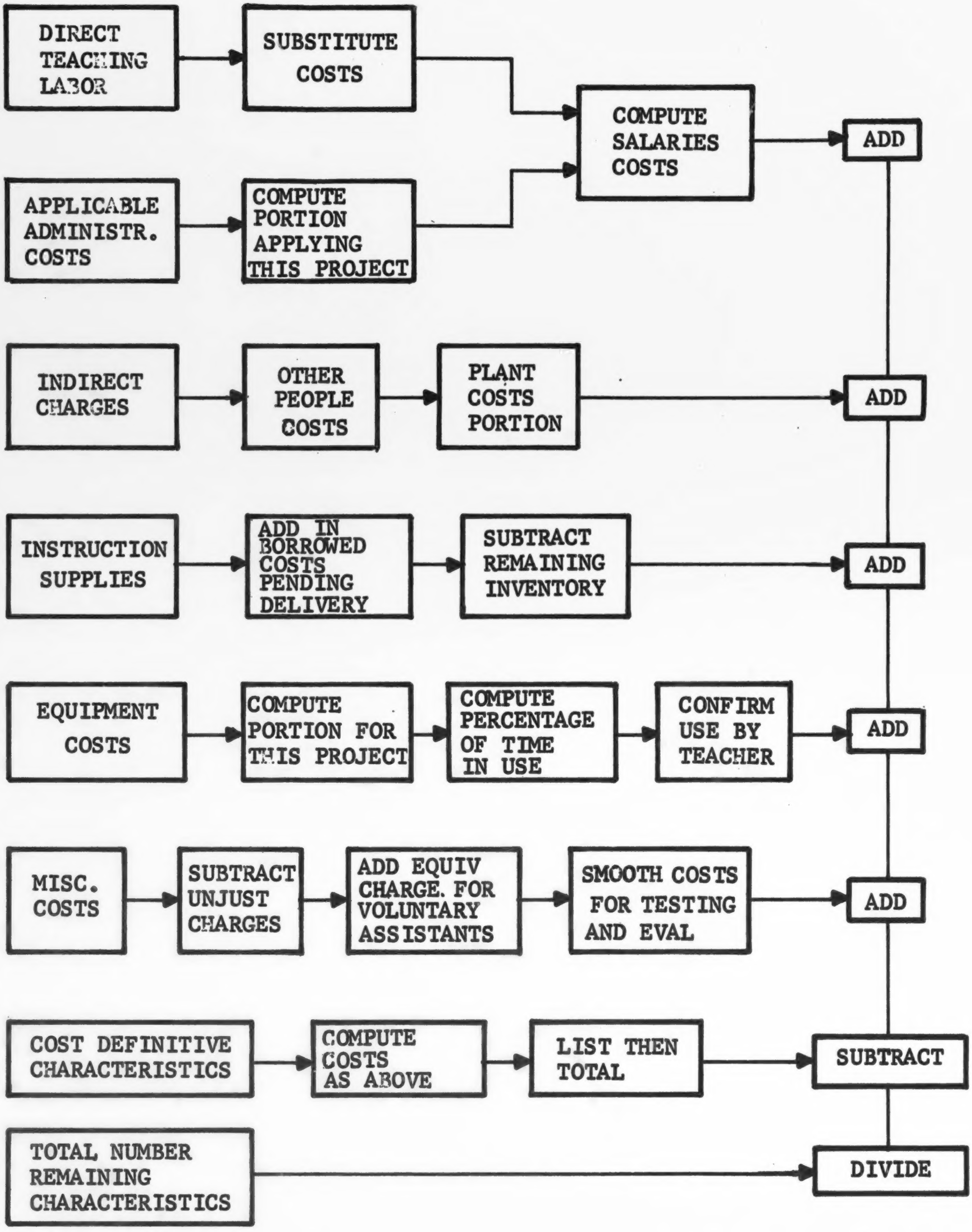
DIRECT TEACHING LABOR
SUBSTITUTE COSTS
COMPUTE SALARIES COSTS
ADD
APPLICABLE ADMINISTR. COSTS
COMPUTE PORTION APPLYING THIS PROJECT
INDIRECT CHARGES
OTHER PEOPLE COSTS
PLANT COSTS PORTION
ADD
INSTRUCTION SUPPLIES
ADD IN BORROWED COSTS PENDING DELIVERY
SUBTRACT REMAINING INVENTORY
ADD
EQUIPMENT COSTS
COMPUTE PORTION FOR THIS PROJECT
COMPUTE PERCENTAGE OF TIME IN USE
CONFIRM USE BY TEACHER
ADD
MISC. COSTS
SUBTRACT UNJUST CHARGES
ADD EQUIV CHARGE. FOR VOLUNTARY ASSISTANTS
SMOOTH COSTS FOR TESTING AND EVAL
ADD
COST DEFINITIVE CHARACTERISTICS
COMPUTE COSTS AS ABOVE
LIST THEN TOTAL
SUBTRACT
TOTAL NUMBER REMAINING CHARACTERISTICS
DIVIDE

FIGURE 2: CENTRAL FLOW OF METHOD TO OBTAIN COST PER CHARACTERISTIC OF A PROJECT

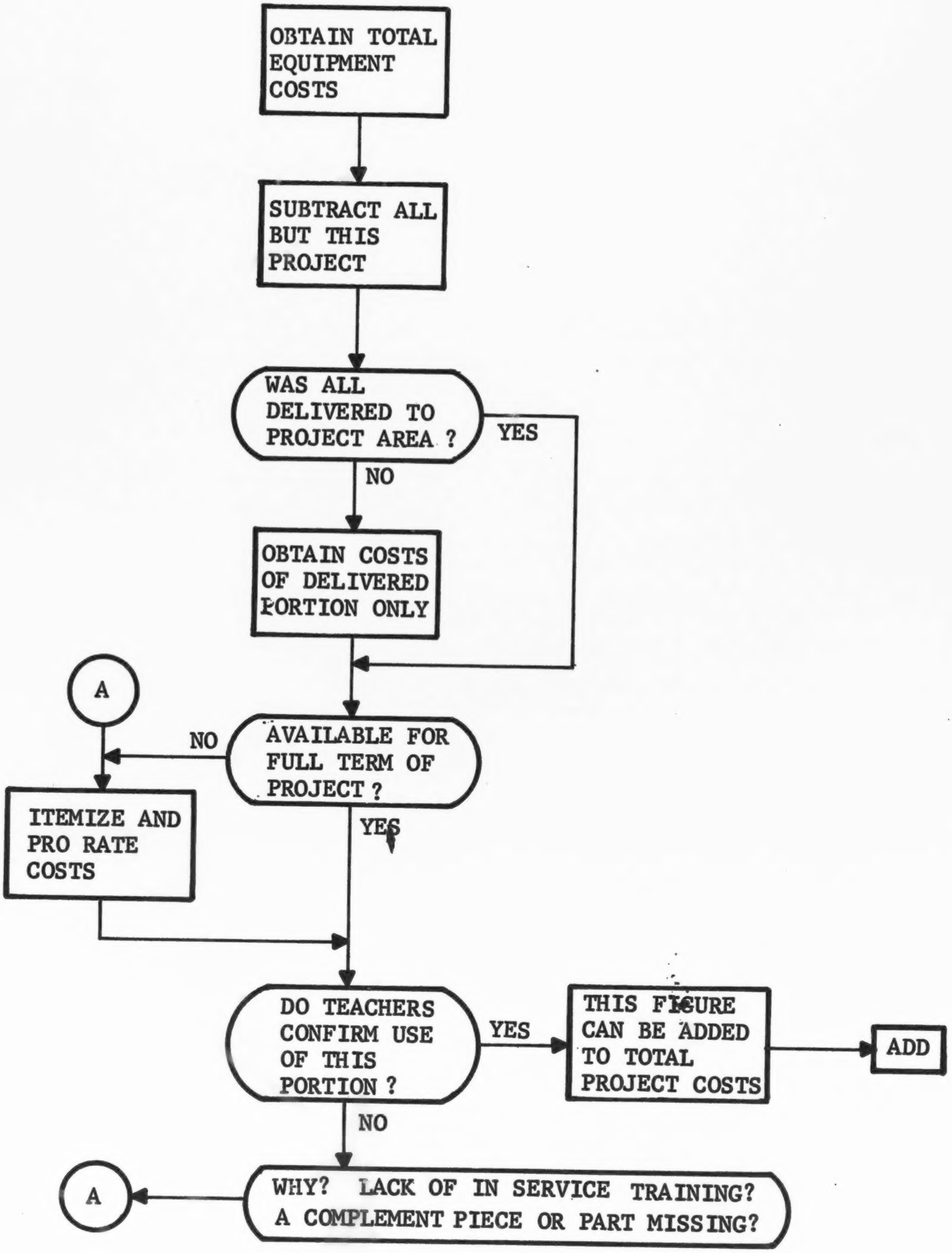
OBTAIN TOTAL EQUIPMENT COSTS
SUBTRACT ALL BUT THIS PROJECT
WAS ALL DELIVERED TO PROJECT AREA ?
YES
NO
OBTAIN COSTS OF DELIVERED PORTION ONLY
A
NO
AVAILABLE FOR FULL TERM OF PROJECT ?
ITEMIZE AND PRO RATE COSTS
YES
DO TEACHERS CONFIRM USE OF THIS PORTION ?
YES
THIS FIGURE CAN BE ADDED TO TOTAL PROJECT COSTS
ADD
NO
A
WHY? LACK OF IN SERVICE TRAINING? A COMPLEMENT PIECE OR PART MISSING?

FIGURE 3: DETAILED FLOW FOR EQUIPMENT COSTS

Step A in Figure 2 attempts to retrieve teaching costs. Both direct and indirect teaching costs must be added in.

Step B directs attention to the retrieval of those administrative costs that can and should be allocated to the project being costed. Now total salary costs are retrieved and ready to enter into the total.

A significant difficulty occurs when direct labor is obtained and is not charged to the project. In such a case, an appropriate actual or estimated dollar figure should be added to the project's total dollar cost. This would yield a more accurate cost-to-benefit relationship. It is conceivable, for example, that a project could obtain some of its working staff on a volunteer basis, with no charges for these workers being made against the project. For another district to implement this project at the same costs would be nearly impossible.

Step C concerns itself with indirect charges. These are, generally, administrative support costs such as secretaries, their equipment, charges such as telephone bills and transportation involved in the project execution, and pro rata shares of heat, light, and space costs. These should be summed and entered in the total.

Step D is to retrieve costs of instructional supplies applied directly to the teaching environment of the project. If instructional supplies are on order but not delivered and supplies must be borrowed, the costs of borrowed items should be computed and, at the end of the project, the costs of supplies not used should be deducted from the total supplies cost.

Step E concerns itself with equipment costs. It is critical to determine the exact portion of the equipment that is "expended" in the particular project time. Each school district must establish amortization schedules for the operational phases of the equipment and use these rates to achieve cost retrieval for equipment use. Notice that Figure 3 spells out Step E of Figure 2 in more detail. (Figure 3 is self-explanatory. Note, however, that instead of leading simply to a derived dollar figure, it leads to a question about "why" something had a particular result. Why was money expended that resulted in no benefits? Was it because equipment was purchased but not used? Cost retrievel methods, carefully carried out, can often uncover unexpected findings.)

Step F in the general flow diagram considers miscellaneous costs. This item is significant because so many items can find their way into this particular portion of the cost flow. There are some costs charged by some districts that are not charged by others. There are many costs that are not charged because certain school districts believe they are overhead expenditures to be absorbed by the school budget. These items include certain transportation costs, plant charges, charges involving janitorial services outside the normal expected maintenance costs, costs of meetings attended by the teaching staff, etc. Consistency and inclusiveness in what should be charged to this item are very much needed.

If at this point, step G, all the costs associated with the project are summed, one has the total costs for all of the characteristics associated with the project--the cost of the characteristics package. At this point, there may be no way to say how much of the total cost should be assigned to any one characteristic. On the other hand, if there is some way to assign an actual dollar cost to a particular characteristic, that cost should be subtracted from the total cost of nondefinitive characteristics. An example of such a definitive characteristic can be thought of in connection with teaching Mexican-American children English as a second language. It might cost an identifiable amount more to recruit teachers who could speak Spanish. The cost, then, of assuring that the learning environment contained the characteristic of a Spanish-speaking teacher can be individually determined and should not be lumped among the costs of other characteristics.

Step H, the final step, consists of dividing the total cost remaining by the number of learning environment characteristics not definitively accounted for. This yields a cost-per-characteristic figure. By adding any definitive characteristic costs back into the total and dividing that total by the number of children served by the project, it would be possible to get a cost-per-pupil figure for a project.

SECTION VI

CONCEPTUAL FINDINGS

A. A Short History of This Study

First steps in examining the possibility of applying some method to a new domain are: 1) to study the characteristics of the domain to determine to what extent they are tractable; 2) to determine whether the method may be applied without modification, or must be tailored to the new domain. Our first conclusion from the study of the domain of interest--education--was that the traditional unit called a "project" was, as constituted, a difficult one to which to apply cost/effectiveness analysis. This finding has held up through the course of our study. Some of the many reasons the project is an inappropriate unit have been discussed in Section III, "Statistical Findings."

In casting about for an alternative to the project as the basic unit for study, we chose to explore the use of what we defined as the characteristics (attributes) of the learning environment. This unit had its advantages and its limitations. Its two most serious limitations were the difficulty of applying meaningful costs to many characteristics that were educationally meaningful, and the fact that characteristics were typically at too great a level of detail. Both factors made them less than optimal for use in cost/effectiveness analysis. They were, however, more helpful than the traditional units. Section III has described in some detail our attempts to develop and use these characteristics.

As a result of our work in the field, we began to see that the objectives sought for by all Title I programs fell into a fairly small number of classes. We began to find ourselves re-aggregating the projects--which we had previously broken down into attributes or characteristics--into a new set of operations at the "project" level, but different than projects themselves.

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From both these prior steps has arisen what we believe is a viable tool for ensuring that cost/effectiveness methodology can be applied to the educational process. In this section, our focus will be on this tool--an adequate system for evolutionary program planning and budgeting. In retrospect, we think it unlikely that the tool could have been found without the frustrations and false steps that preceded its discovery; they were, in the last analysis, very instructive.

As will be spelled out in the next part of this section, our method relates educational operations or functions to stages in educational growth in matrix form, making it possible to see the distribution of educational effort across a school, a group of schools, or a whole district.

B. The Structure of the Planning Tool

Educational Stages

Let us first name and define seven stages in the educative process--seven stages that represent a time-bound sequence of necessary conditions for attaining the goals of the educational process:

1) Infusion of Basic Behavioral Repertoire

2) Infusion of Constructive Attitudes

Before a child can successfully attain in our schools, he must learn such things as the ability to ask questions, to hold a discussion with an adult, to see differences between things, to see similarities between things; he must have experienced the things he will come to read about and have the words to describe them in his vocabulary; he must be able to follow simple directions, and so on. It is the paucity of the behavioral and attitudinal repertoire of the impoverished child that makes him an educational problem. He comes to the school prepared to fail. Until recently, American education has depended upon the home to infuse into the child these basic pre-school skills and positive attitudes toward direct learning.

3) Infusion of Basic Skills

The next state in a child's education is the attainment of the basic academic skills--the three R's. Without the attainment of these skills, most of what will be presented to him later will go unlearned.

4) Infusion of General Knowledge

5) Infusion of Problem-Solving Skills

After the basic academic skills have been attained, the child must master knowledge of the world about him and achieve the capacity for logical thinking and inquiry.

6) Attainment of Vocational and Avocational Competence

The final step (as far as the graded school system is concerned) is the infusion of the knowledges and skills that prepare the young person to go to work and keep his job, or to move toward collegiate and professional training.

7) Adult Education

We define adult education here as optimally dedicated to further infusion of vocational and avocational competence and retraining where necessary.

Figure 4 suggests the overlapping, ordered nature of the stages in educational attainment in the public school. Note that the time scale begins with a -1 year. This is to imply that the first educative stage the child must go through may be hastened and better insured by training the parents before the child's birth. Notice that in some of the stages a dashed line precedes the solid line, and in some stages a dashed line follows the solid line. The solid lines represent periods of optimal infusion; the dashed lines illustrate that these stages do not suddenly start and abruptly halt, and that indeed they are not totally independent of one another.

Educational Operations

As a result of our field work, we had begun grouping the functions performed by Title I projects into a small number of classes. Extending this concept, we were able to compile and classify the functions or operations that must be undertaken by a school system to ensure that its pupils will ascend through the educative stages:

A Program is the inclusive set of operations that, as completely as possible, describe the activities of the (educational) system; the school

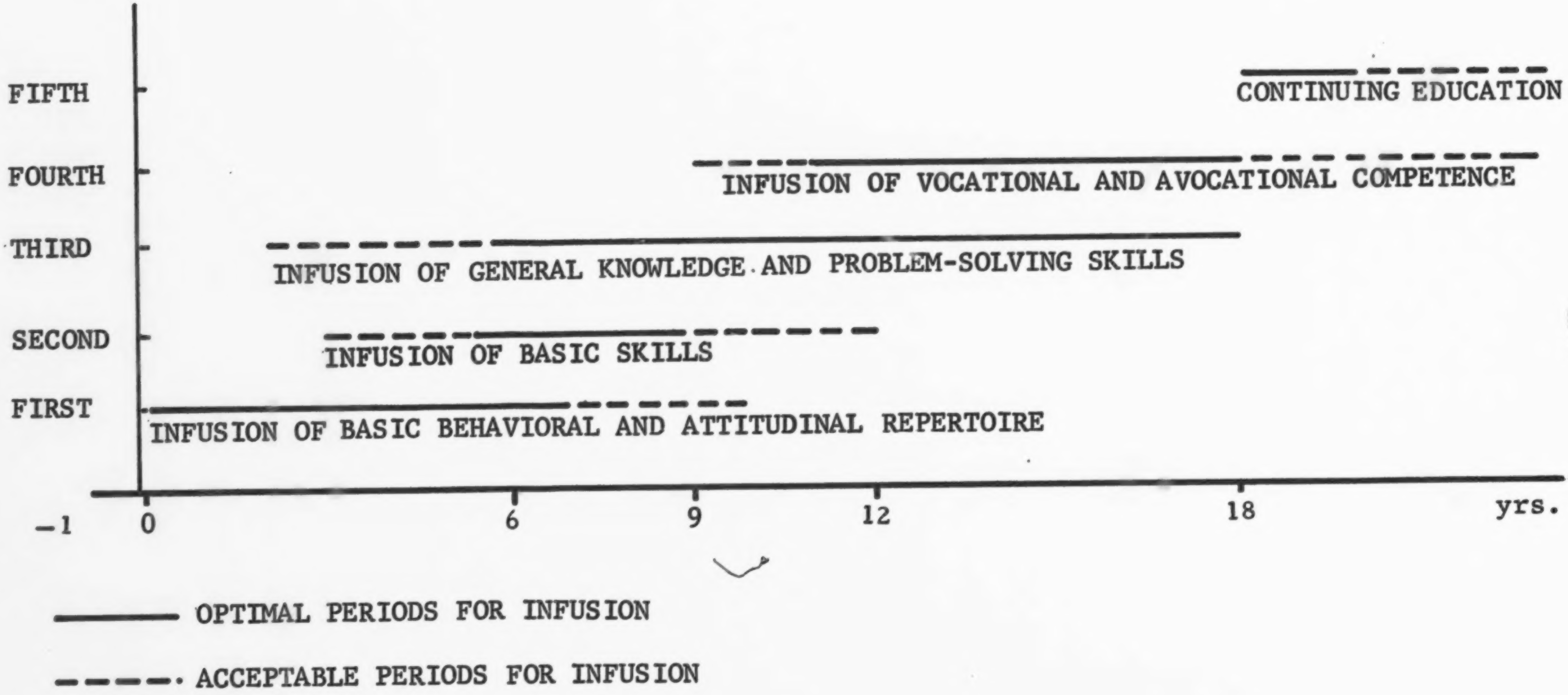

FIGURE 4: REPRESENTATION OF STAGES IN EDUCATIONAL ATTAINMENT AND PERIODS OF OPTIMAL AND ACCEPTABLE INFUSION.

system's overall program can be considered as a set of subprograms composed of program elements. Each subprogram can be thought of as designed to accomplish an educational stage. In actuality, present programs are more realistically related to a grade or a small set of grades in school because of the spread of educational stages of students in schools and the variance between obtained level and expected level of education in particular grades.

A Program Element Class is a taxonomical category for an aspect of a program that serves some function or accomplishes some objective of the system. We define two such classes: Core Element Classes--operations aimed directly at insuring successful infusion at each stage--and Support Element Classes--operations undertaken to support core operations.

A Program Element is a set of operations that is designed to serve the objective or function defined by the class to which it belongs. A program element class can potentially be satisfied by a large variety of program elements. Taking an example outside the field of education, a need for "transportation" might be filled by a bicycle, rollerskates, car, bus, or train; depending on the exact needs, one element might serve better than another. Even more subtle distinctions, such as between automobiles with certain characteristics rather than others, may be considered at this level of analysis (here we are analyzing elements rather than programs). It is convenient at this point to recall the distinction made in Section III between general and limited characteristics. From this new conceptual point of view, it becomes obvious that the distinction is actually between characteristics of the total program and characteristics that belong to and primarily influence the operation of a program element. There may be a number of choices among characteristics at the program-element level; different choices would result in the creation of elements whose nature would vary greatly; more than one of the possible combinations of program-element characteristics might result in a successful program element. Now move up one step in the conceptual hierarchy, and an entirely different range of choices opens. Interior characteristics of the program elements may become immaterial, but there is a range of possible program elements that can perform the functions of each program element class. Choices at this level determine the characteristics of the total program.

Core Program Element Classes. Listed below are six sets of operations that are called core elements because they constitute the essence of the educational system. They are what the school is about and the purposes for which the school exists.

A) Insuring the presence of an adequate basic behavioral repertoire (i.e., the ability to differentiate, identify, discuss, etc.)

B) Insuring the formation of constructive attitudes (toward learning and the learning milieu)

C) Insuring the learning of basic academic skills (the three R's, the tools of general learning)

D) Insuring acquisition of general knowledge

E) Insuring acquisition of problem-solving skills

F) Insuring acquisition of vocational and avocational competence.

The reader will recognize these elements as operations undertaken directly to insure that the stages in the educational process are successfully accomplished.

Support Program Element Classes. Here are listed all the program element classes that are undertaken in support of core elements. There is a rough logical ordering in their listing; they are shown in the sequence that might be followed by a school district undertaking to launch a major new program.

G) Assuring community-school cooperation

H) Assuring administrative effectiveness

I) Assuring coordination with other agencies

J) Assuring for personnel training and experiences

K) Assuring parent-school cooperation

L) Assuring maintenance of health, hygiene and welfare

M) Assessing pupils' educational needs and progress

N) Providing adequate educative resources

O) Assuring optimal level of individual attention

P) Meeting special systems needs (such as bussing)

Q) Facilitating curricular innovation and development

R) Assuring compatibility between laws and policies and the school system's needs

S) Applying relevant research findings.

The Educational Possibility Space

Next we show relations between the program element classes and the educational stages by arranging them in matrix form. The educative stages are arranged on the vertical axis and the program element classes are arranged on the horizontal axis. (See Figure 5.) (Conventionally, the program element classes, as inputs, would be arranged on the vertical axis of the matrix and the educative stages, as outputs, would be arranged on the horizontal axis. We have arbitrarily reversed this arrangement

FIGURE 5: MATRIX REPRESENTING EDUCATIONAL POSSIBILITY SPACE.

	AGE
1	(0-5) P
2	(6-8)
3	(9-1
4	(12-1
5	(15-1
6	19- E

AGE / GRADE	EDUCATIVE STAGES	A INSURING THE PRESENCE OF AN ADEQUATE BASIC BEHAVIORAL REPERTOIRE	B INSURING THE FORMATION OF CONSTRUCTIVE ATTITUDES	
(0-5) PRESCHOOL	INFUSION OF BASIC BEHAVIORAL AND ATTITUDINAL REPERTOIRE			▨
(6-8) 1-3	INFUSION OF BASIC ACADEMIC SKILLS	▨	▨	
(9-11) 4-6	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS	░	░	▨
(12-14) 7-9	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS & VOCATIONAL AND AVOCATIONAL COMPETENCE	░	░	░
(15-18) 10-12	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS & VOCATIONAL AND AVOCATIONAL COMPETENCE	░	░	░
19- n ADULT EDUCATION	INFUSION OF VOCATIONAL AND AVOCATIONAL COMPETENCE	░	░	░
	COSTS			

☐ OPTIMAL FIRST TIME ▨

CORE ELEMENTS			
C INSURING THE LEARNING OF BASIC ACADEMIC SKILLS	D INSURING ACQUISITION OF GENERAL KNOWLEDGE	E INSURING ACQUISITION OF PROBLEM-SOLVING SKILLS	F INSURING ACQUISITION OF VOCATIONAL AND AVOCATIONAL COMPETENCE
▨	░	░	░
	▨	▨	░
▧			░
░			
░			
░	▧	▧	

▨ APPROPRIATE INTRODUCTORY PERIOD

▧ APPROPRIATE COMPLETION PERIOD

░ TOO EAR

COSTS	G ASSURING COMMUNITY-SCHOOL COOPERATION	H ASSURING ADMINISTRATIVE EFFECTIVENESS	I ASSURING COORDINATION WITH OTHER AGENCIES

Y OR TOO LATE

SUPPORT ELEMENTS			
J ASSURING FOR PERSONNEL TRAINING AND EXPERIENCES	K ASSURING PARENT-SCHOOL COOPERATION	L ASSURING MAINTENANCE OF HEALTH, HYGIENE AND WELFARE	M ASSESSING PUPILS EDUCATIONAL NEEDS AND PROGRESS

N PROVIDING ADEQUATE EDUCATIVE RESOURCES	O ASSURING OPTIMAL LEVEL OF INDIVIDUAL ATTENTION	P MEETING SPECIAL SYSTEM NEEDS	Q FACILITATING CURRICULAR INNOVATION AND DEVELOPMENT	AS CO BI PO SO

R ASSURING COMPATIBILITY BETWEEN LAWS, POLICIES AND SCHOOL SYSTEM NEEDS	S APPLYING RELEVANT RESEARCH FINDINGS	COSTS	TOTAL COSTS

here for simple convenience in handling the sheet of paper on which the matrix appears.)

This matrix defines the educational possibility space and forms a frame of reference that can be used in a number of ways to assist in developing program planning and budgeting and in assessing program effectiveness.

First of all, one can get a picture of how the educational program in a district (or portion thereof) is distributed over the possibility space. This can be done by identifying the educational activities in the district, giving each activity a number, and entering these numbers in the appropriate cells of the matrix according to the grade level of the activity and the operations or elements to which the activity contributed. For example, a remedial reading program in the sixth grade that involved systematic visits with parents and utilized special training devices would be entered in three cells: Row 3, Column C; Row 3, Column K; and Row 3, Column N. Where costs are available, they can be apportioned among the three cells, thus making it possible to see not only what operations are being performed, but also what it is costing to perform each operation at each educational level.

Figure 6 shows a (somewhat hypothetical) distribution over the educational possibility space of Title I projects and associated costs for one of the twelve cities we surveyed. We present it here for illustrative purposes only. The cost figures shown are neither reliable nor complete, and their allocation was arbitrary. Nevertheless, it is suggestive of how a district might apportion its dollar expenditures among core and support elements.

FIGURE 6: DISTRIBUTION OF COSTS BY PROJECT, BY EDUCATIVE STAGE, AND BY ELEMENT FOR ONE SAMPLE CITY.

	A
1	(1
2	(6
3	(9
4	(12
5	(15
6	19

AGE	EDUCATIVE STAGES	A INSURING THE PRESENCE OF AN ADEQUATE BASIC BEHAVIORAL REPERTOIRE	B INSURING THE FORMATION OF CONSTRUCTIVE ATTITUDES	C INSURING THE LEARNING OF BA ACADEMIC SKILL
0-5	INFUSION OF BASIC BEHAVIORAL AND ATTITUDINAL REPERTOIRE	④ 104,646 ⑧ 1,980 ⑫ 13,561 ⑮ 6,443 ⑯ 2,900 # 129,530	④ 52,323 ⑧ 1,980 ⑫ 3,390 ⑮ 6,443 # 64,136	⑧ 1,980 ⑯ 5,801 7,781
6-8	INFUSION OF BASIC ACADEMIC SKILLS	[illegible] 5,072 [illegible] 1,980 [illegible] 1,103 [illegible] 13,561 [illegible] 6,443 [illegible] 2,900 [illegible] 8,438 39,497	[illegible] 15,216 [illegible] 1,980 [illegible] 14,435 [illegible] 1,810 [illegible] 4,410 [illegible] 3,390 [illegible] 6,443 47,684	② 13,433 ⑧ 1,980 ⑨ 28,870 ⑩ 1,810 ⑪ 1,103 ⑯ 5,801 ⑰ 3,449 ⑲ 10,635 67,081
9-1	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS	⑥ 5,072 ⑧ 1,980 ⑪ 1,103 ⑫ 13,561 ⑮ 6,443 ⑯ 2,900 ㉑ 8,438 39,497	⑥ 15,216 ⑧ 1,980 ⑨ 14,435 ⑩ 1,810 ⑪ 4,410 ⑫ 3,390 ⑬ 6,102 ⑮ 6,443 53,786	[illegible] 13,433 [illegible] 1,980 [illegible] 28,870 [illegible] 1,810 [illegible] 1,103 [illegible] 2,634 [illegible] 5,801 [illegible] 10,635 65,6
2-1	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS & VOCATIONAL AND AVOCATIONAL COMPETENCE	⑧ 1,980 ⑪ 1,103 ⑫ 13,561 ⑯ 2,900 ⑱ 22,250 ㉑ 8,438 50,232	⑤ 19,162 ⑧ 1,980 ⑩ 1,810 ⑪ 4,410 ⑫ 3,390 ⑱ 7,417 38,169	⑤ 15,336 ⑧ 1,980 ⑩ 1,810 ⑪ 1,103 ⑯ 5,801 ⑲ 10,635 36,665
5-1	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS & VOCATIONAL AND AVOCATIONAL COMPETENCE	⑪ 1,103 ⑱ 22,250 ㉑ 8,438 31,791	⑤ 19,162 ⑩ 1,810 ⑪ 4,410 ⑱ 7,417 32,799	⑤ 15,336 ⑩ 1,810 ⑪ 1,103 18,249
0- N	INFUSION OF VOCATIONAL AND AVOCATIONAL COMPETENCE	— 0 —	— 0 —	— 0 —
	COSTS	290,574	236,574	192,442

☐ OPTIMAL FIRST TIME

▨ APPROPRIA
INTRODUCT

CORE ELEMENTS

C	D INSURING ACQUISITION OF GENERAL KNOWLEDGE	E INSURING ACQUISITION OF PROBLEM-SOLVING SKILLS	F INSURING ACQUISITION OF VOCATIONAL AND AVOCATIONAL COMPETENCE	COSTS
▨	░ [illegible] 2,900	░ — 0 —	░ — 0 —	204,347
	▨ 14,435 1,810 1,103 [illegible] [illegible] [illegible]	▨ ⑪ 1,103	░ — 0 —	179,062
▨	⑨ 14,435 ⑩ 1,810 ⑪ 1,103 ⑬ 2,034 ⑯ 2,900 22,282	⑪ 1,103	░ — 0 —	182,334
░	③ 38,325 ⑤ 15,336 ⑩ 1,810 ⑪ 1,103 ⑯ 2,900 59,474	③ 19,162 ⑪ 1,103 ⑱ 7,417 27,682	⑱ 7,417	219,639
░	③ 38,325 ⑤ 15,336 ⑩ 1,810 ⑪ 1,103 56,574	③ 19,162 ⑪ 1,103 ⑱ 7,417 27,682	⑱ 7,417	174,512
░	▨ — 0 —	▨ — 0 —	— 0 —	— 0 —
	164,927	57,570	14,834	959,894

PERIOD ▨ APPROPRIATE COMPLETION PERIOD ░ TOO EARLY OR TOO LATE

G ASSURING COMMUNITY-SCHOOL COOPERATION	H ASSURING ADMINISTRATIVE EFFECTIVENESS	I ASSURING COORDINATION WITH OTHER AGENCIES	J ASSURING FOR PERSONNEL TRAINING AND EXPERIENCES
— 0 —	— 0 —	— 0 —	① 8,480 ⑦ 10,288 18,768
⑰ 3,449	— 0 —	— 0 —	① 8,480 ⑦ 10,288 18,768
— 0 —	— 0 —	— 0 —	① 8,480 ⑦ 10,288 18,768
— 0 —	— 0 —	— 0 —	① 8,480 ⑦ 10,288 18,768
— 0 —	— 0 —	— 0 —	① 8,480 ⑦ 10,288 18,768
— 0 —	— 0 —	— 0 —	— 0 —
3,449	— 0 —	— 0 —	93,840

SUPPORT ELEMENTS

	K ASSURING PARENT-SCHOOL COOPERATION	L ASSURING MAINTENANCE OF HEALTH, HYGIENE AND WELFARE	M ASSESSING PUPILS EDUCATIONAL NEEDS AND PROGRESS	N PROVIDING ADEQUATE EDUCATIVE RESOURCES
G				
	④ 52,323 ⑧ 1,980 54,303	⑧ 7,922	— o —	⑦ 3,390
	⑧ 1,980 ⑳ 8,649 10,629	⑧ 7,922 ⑳ 8,649 ㉑ 8,438 25,009	⑲ 5,318	② 13,433 ⑥ 5,072 ⑩ 5,430 ⑫ 3,390 ⑰ 10,346 37,678
	⑧ 1,980 ⑳ 8,649 10,629	⑧ 7,922 ⑳ 8,649 ㉑ 8,438 25,009	⑲ 5,318	② 13,433 ⑥ 5,072 ⑩ 5,430 ⑫ 3,390 ⑬ 2,034 29,359
	⑧ 1,980 ⑳ 8,649 10,629	⑧ 7,922 ⑳ 8,649 ㉑ 8,438 25,009	⑲ 5,318	⑩ 5,430 ⑫ 3,390 8,820
	⑳ 8,649	⑳ 8,649 ㉑ 8,438 17,087	— o —	⑩ 5,430
	— o —	— o —	— o —	— o —
	94,839	100,036	15,954	84,670

E	O ASSURING OPTIMAL LEVEL OF INDIVIDUAL ATTENTION	P MEETING SPECIAL SYSTEM NEEDS	Q FACILITATING CURRICULAR INNOVATION AND DEVELOPMENT	R ASSURING COMPATIBILITY BETWEEN LAWS, POLICIES AND SCHOOL SYSTEM NEEDS
	— 0 —	— 0 —	① 8,480 ⑦ 10,288 ⑫ 3,390 22,158	⑫ 3,390
	② 40,299 ⑲ 5,318 45,617	— 0 —	① 8,480 ② 13,433 ⑥ 5,072 ⑦ 10,288 ⑫ 3,390 40,663	⑫ 3,390
	② 40,299 ⑲ 5,318 45,617	— 0 —	① 8,480 ② 13,433 ⑥ 5,072 ⑦ 10,288 ⑫ 3,390 40,663	⑫ 3,390
	⑲ 5,318	— 0 —	① 8,480 ⑦ 10,288 ⑫ 3,390 22,158	⑫ 3,390
	— 0 —	— 0 —	① 8,480 ⑦ 10,288 18,768	— 0 —
	— 0 —	— 0 —	— 0 —	— 0 —
	96,552	— 0 —	144,410	13,560

S APPLYING RELEVANT RESEARCH FINDINGS	COSTS	TOTAL COSTS
— 0 —	109,931	314,278
— 0 —	190,514	369,576
— 0 —	178,753	361,087
— 0 —	99,410	319,049
— 0 —	68,702	243,214
— 0 —	— 0 —	— 0 —
— 0 —	647,310	1,607,204

CIRCLED NUMBERS IDENTIFY PROJECTS

Figure 7 presents an analysis of spending with all costs allocated among the core elements only. In this figure, the amounts spent (both direct and indirect) are allocated to each cell and presented as percentages of the total amount spent for Title I activities. Amounts spent on core elements directly are shown in the topmost figure. The second figure is that amount of cost spent on support elements and allocatable to the given core element. These are summed below the line. To the right and below each sum is that cell's percentage of the total amount spent.

One final set of definitions:

An Element State is defined by the function that element performs with reference to the educative stages. There are four states:

A Source State is that in which the program element operates at what is judged to be the appropriate first time for optimal results in the system.

An Early-Introduction State is that in which the element is applied earlier than the majority of pupils are ready, but not before some of the pupils are ready. If some children, for example, are beginning to read in kindergarten, the introduction of a reading activity would constitute an early-introduction state of an element in the class "assuring the learning of basic academic skills."

A Compensatory State is that in which the element performs a function for the first time in the system, but not at the most appropriate time for optimal results (it is, by definition, already late).

A Remedial State is that in which the element is applied after its operation in the source state has failed, or its operation in the compensatory state or an earlier remedial state has failed.

FIGURE 7: DISTRIBUTION OF AGGREGATED COSTS BY EDUCATIVE STAGE OVER CORE ELEMENTS FOR ONE SAMPLE CITY.

1
2
3
4
5
6

AGE / GRADE	EDUCATIVE STAGES	A INSURING THE PRESENCE OF AN ADEQUATE BASIC BEHAVIORAL REPERTOIRE	B INSURING THE FORMATION OF CONSTRUCTIVE ATTITUDES	I L A
(0-5) PRESCHOOL	INFUSION OF BASIC BEHAVIORAL AND ATTITUDINAL REPERTOIRE	130 69 199 12%	64 34 98 5%	
(6-8) 1-3	INFUSION OF BASIC ACADEMIC SKILLS	39 40 79 5%	48 53 101 6%	7
(9-11) 4-6	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS	39 38 77 5%	54 54 108 7%	1
(12-14) 7-9	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS & VOCATIONAL AND AVOCATIONAL COMPETENCE	50 23 73 5%	38 18 56 3%	3
(15-18) 10-12	INFUSION OF GENERAL KNOWLEDGE AND PROBLEM SOLVING SKILLS & VOCATIONAL AND AVOCATIONAL COMPETENCE	32 12 44 3%	33 13 46 3%	1 2
19- n ADULT EDUCATION	INFUSION OF VOCATIONAL AND AVOCATIONAL COMPETENCE	— 0 —	— 0 —	
	COSTS IN THOUSANDS	290 182 472 30%	237 172 409 24%	1 1 3

☐ OPTIMAL FIRST TIME ▨

	CORE ELEMENTS			
	C INSURING THE LEARNING OF BASIC ACADEMIC SKILLS	D INSURING ACQUISITION OF GENERAL KNOWLEDGE	E INSURING ACQUISITION OF PROBLEM-SOLVING SKILLS	F INSURING ACQUISITION OF VOCATIONAL AND AVOCATIONAL COMPETENCE
%	▨ 8 4 12 .7%	░ —0—	░ —0—	░ —0—
▧ %	67 70 137 8.7%	▨ 24 25 49 3%	▨ 1 2 3 0.2%	░ —0—
░ %	▧ 66 64 130 8%	22 21 43 3%	1 2 3 0.2%	░ —0—
░ %	░ 37 17 54 3%	59 27 86 5%	28 13 41 3%	7 3 10 0.6%
░ %	░ 18 7 25 2%	57 23 80 5%	28 11 39 3%	7 3 10 0.6%
░	░ —0—	▧ —0—	▧ —0—	—0—
%	196 162 358 22.4%	162 96 258 16%	58 28 86 6.4%	14 6 20 1.2%

▨ APPROPRIATE INTRODUCTORY PERIOD

▧ APPROPRIATE COMPLETION PERIOD

░ TOO EARL

CORE ELEMENTS			
D INSURING ACQUISITION OF GENERAL KNOWLEDGE	E INSURING ACQUISITION OF PROBLEM-SOLVING SKILLS	F INSURING ACQUISITION OF VOCATIONAL AND AVOCATIONAL COMPETENCE	COSTS IN THOUSANDS
▒ —0—	▒ —0—	▒ —0—	205 110 315 13% 7% 20%
▨ 24 25 49 3%	▨ 1 2 3 0.2%	▒ —0—	179 190 369 11% 12% 23%
22 21 43 3%	1 2 3 0.2%	▒ —0—	182 179 361 11% 11% 22%
59 27 86 5%	28 13 41 3%	7 3 10 0.6%	219 100 319 14% 6% 20%
57 23 80 5%	28 11 39 3%	7 3 10 0.6%	175 69 244 11% 4% 15%
▨ —0—	▨ —0—	—0—	—0—
162 96 258 16%	58 28 86 6.4%	14 6 20 1.2%	960 648 1,608 60% 40% 100%

PERIOD

▨ APPROPRIATE COMPLETION PERIOD

▒ TOO EARLY OR TOO LATE

The subsidiary matrix shown in Figure 8 relates core elements to their various states (across all educational stages). Reading across a row of this matrix is roughly akin (but not equivalent) to reading down a column of the larger matrix that defines the total educational possibility space.

		STATES			
	CORE ELEMENTS	EARLY INTRODUCTORY	SOURCE	COMPENSATORY	REMEDIAL
A	INSURING THE PRESENCE OF AN ADEQUATE BASIC BEHAVIORAL REPERTOIRE				
B	INSURING THE FORMATION OF CONSTRUCTIVE ATTITUDES				
C	INSURING THE LEARNING OF BASIC ACADEMIC SKILLS				
D	INSURING ACQUISITION OF GENERAL KNOWLEDGE				
E	INSURING ACQUISITION OF PROBLEM-SOLVING SKILLS				
F	INSURING ACQUISITION OF VOCATIONAL AND AVOCATIONAL COMPETENCE				
	TOTALS				

FIGURE 8: SUBSIDIARY MATRIX FOR ENTERING COSTS OF CORE ELEMENTS APPLIED IN VARIOUS STATES.

C. How the Planning Tool Works

Reduced to its most abstract terms, the problem that faces educational planners is the familiar economic problem of allocating a limited resource. The school systems have a fixed number of dollars per year to support the educational process; there are many alternative choices about how to spend those dollars; what the school systems need is a way of predicting the effectiveness of changes in dollar allocations, given either success or failure of the elements of an educational program.

It is exactly this that our planning matrix accomplishes.

First, it needs to be stressed that this tool can be used in several different ways:

The matrix can be applied in a descriptive way. Any school system whose accounting procedures permitted the extraction of the necessary cost figures could take this matrix today and record its expenditures in the appropriate cells. That is, it could express and make visible on a single page the nature of its current choices about the allocation of its resources.

Faced with the resultant figures, some systems might say that their expenditures were not "by choice" at all; no system, for example, would "choose" to spend large sums of money on remedial reading in the tenth grade. But, as the following discussion will make clear, the state of an educational system is a direct result of its prior states, and those states of states still prior. By tracing this history far enough, one may find the point at which a real choice was made--a choice that had the direct (if unforeseen) consequence of dictating that at some later time large sums would have to be spent on remediation. (It could be noted that not making a choice is indeed making a choice.)

The matrix can also be applied in a normative way. Without reference to the current state of the system, educational planners could take the matrix and allocate available funds among the cells in the same optimal way.

Some of these allocations would be based on judgment, policy, or educational philosophy. For example, a decision must be made about the portion of school funds that should be allocated to continuing education. A decision must be made as to whether the schools' medical services should be corrective or simply diagnostic.

There are, however, a number of planning decisions that are guided by the matrix itself:

1) An ideal program is one in which the bulk of the expenditures for core elements occurs on the main diagonal of the large matrix (that is, in the unshaded cells of Figure 5).
2) An ideal program is one in which the bulk of the expenditure for each core element is restricted to a single cell of that element's column in the large matrix (Figure 5).
3) An ideal program is one in which the bulk of the expenditure for core elements occurs in the "source state" column of the subsidiary matrix (Figure 8).

In short, this matrix possesses a characteristic that seems to be missing from previous attempts to facilitate educational planning, budgeting, or overall evaluation; it contains built in, visible criteria of educational effectiveness.

Last, but most important, the matrix can be applied in a predictive way. It is insufficient merely to describe the present state of an educational system; it is insufficient merely to set up a hypothetical statement of ideal expenditures and declare, "This is our goal--in ten years we plan to be spending our educational dollars in these more efficient and practical ways." The real question is, given the nature of the existing system, can the educational process be expected to evolve toward that goal, or is the weight of the system pulling it farther and farther away from its desired objectives? A fundamentally useful planning tool must provide some clues to the direction of the arrows of progress in the system, and this our matrix can also do.

Because of the degree of interdependency among the components of the educational possibility space, a certain degree of confidence can be attached to predictions about the results of single changes. For example, suppose that a school system were to decide to embark on an extensive preschool program in behalf of the program element classes we have labeled "A" and "B." What would be the effects on the next higher educational stage? With some surety, we could predict that the need for compensatory and remedial states of elements A and B would be lessened. The money saved by the reduced need for remediation could be applied to strengthening elements in the source state at that second stage--namely, the basic skills we have labeled "C." Because of their better grounding, more pupils would be functioning comfortably in element

C anyway, so the change in educative stage 1 would have produced a double benefit in educative stage 2. What are the effects on the next stage--stage 3? The increased strength of the source element at stage 2 means, again, that more pupils come to stage 3 able to learn and attain. Even fewer dollars need to be spent on compensation and remediation. The source elements at this stage--general knowledge and problem-solving skills--can be broadened and enriched with the available extra money, ensuring that benefits are transmitted to subsequent stages--and so on and on.

This discussion of its predictive value reflects the evolutionary nature of the proposed matrix. Change produces change, and that change produces still further changes, which spread in waves of success or failure, depending on the direction of the first change. For reasons that will become clearer in the discussion of internal measures of effectiveness (below)--we can state that the direction of the arrows of progress is related to the degree of success of the existing program. If things are good, they will tend to get better. If things are bad, they will tend to get worse.

For example, look at all the cases in which large sums are being spent on educational remediation. Some broad statements can be made about remediation in general: 1) if large sums are being spent on a core element in the remedial state, it can be inferred that there is a chronic failure of other states of that element (source or compensatory), or that there is a chronic failure of some prior element (in all of its four states); 2) nothing in the success of a remedial element reduces the need for the remediation itself. These facts illustrate the distinction--common in industry but often overlooked in education--between product control and process control. A manufacturer may be able to locate every single faulty unit that comes off his assembly line. He may be able to pull such units off the conveyor belt, shunt them to another part of the system, repair the faults, and store them in his warehouse of salable items. His product control system is operating at 100% efficiency. But if the manufacturing process itself contains a built-in flaw that consistently produces faulty units, he is wasting all the money that is spent on product control. This sequence of events has an exact parallel in education, with the additional disadvantage that the whole problem grows as the educational system grows. A wave of increasing failure emanates from the first rock dropped in the pond.

But even though things may be bad, a system isn't doomed if it can begin to direct attention toward the improvement of crucial portions of its educational process. Improvement depends on two things: steps must be taken to increase the chances of success of each currently existing element; change in the system must be directed toward the source state of all elements. If the wave analogy hold--and we believe it does--attention must be given to ensuring that change tends to produce interference and dampening in the waves of failure, and amplification of the waves of success.

D. Internal Measures of Educational Effectiveness

So far, we have talked in descriptive terms about how the matrix may be used; here we consider some mathematical indices by which to judge either a current school program or a predicted school program. Once costs are entered in the cells of the matrix, it becomes possible to begin some internal assessments of the effectiveness of the educational system. (Note well that the term "educational system" is used, and not "school system." It is all too clear that the home environment is a very real part of the educational system but, as yet, not a significant part of the school system.)

One gross measure of educational effectiveness may be achieved by applying the following formula:

$$E_1 = 1 - \frac{C_R}{C_T} \qquad (1)$$

where E_1 is the index of effectiveness, C_R is the amount spent on elements in the remedial state (and elements introduced too early) and C_T is the sum of all costs of all elements. The larger the resultant number, the more effective prior source or compensatory elements have been.

A more stringent measure would be obtained by applying the following formula:

$$E_2 = 1 - \frac{C_R + C_C}{C_T} \qquad (2)$$

where E_2 is a second index of effectiveness, C_R is the cost of elements applied in the remedial state, C_C is the cost of elements applied in the compensatory state, and C_T is the total cost of all elements. The larger the resultant number, the more effective the program has been with respect to normative standards.

If one thinks in terms of a system as an evolutionary process, two conclusions follows:

1) The larger the expenditure of funds for elements in the compensatory and remedial states (especially remedial states) proportionate to all funds being spent, the more likely that an even larger proportion of funds is going to be spent on elements in compensatory and remedial states later.

2) The larger the proportion of funds expended for elements in the source states at any moment in time, the less will probably be the need for the application of compensatory and remedial states in the future.

In determining costs, it must be recognized that they are not simply expenditures. Expenditures may result in savings in some locations and losses in other locations. The cost of providing the education may be obtained as follows:

$$C = E - S + L \qquad (3)$$

where C is cost, E is expenditure, S is savings, and L is loss.

To illustrate these variables, let us consider a couple of situations:

A remedial reading project would expend money for teachers, materials, heat, light, space, supervision, and administration. Savings could be estimated in terms of how much more it would cost to do the job later. Loss could be estimated from loss in later productivity because of what the pupil failed to learn in the regular classroom while he was not adequately prepared to learn.

As a second example, consider the school that installed acoustical flooring (carpeting) in all classrooms. The expenditures related to carpet purchase, installation, and maintenance. Savings were realized in lower maintenance costs and in reduced vandalism. Teachers reported the children to be much less excitable. They also reported much less fatigue at the end of the day. While it would be impossible to do it precisely, one might allocate some kind of a dollar figure to savings in personnel turnover or to more children learning at improved rates. One loss was reported; the custodian was not fully utilized.

It is a social fact that low educational attainment is significantly associated with costs of incarceration and of social welfare status. In an overall assessment of educational benefits, some savings will obviously not be visible for many years, but conceivably could be predicted.

E. External Measures of Educational Effectiveness

Having considered measures that can be directly and immediately related to the dollar figures derived from the core-element/educative-stage matrix, we turn now to some measures external to the school system--measures that look at education from a larger point of view. During the course of this study we have seen no effort being made by school districts to evaluate their overall economic efficiency nor to assess in any way how productive they are for the amount they spend. It seems to us that such efforts would be both revealing and helpful.

For example, we could look at what might simply be called "school effectiveness"--effectiveness in getting the average child to advance one academic year in attainment during one academic year of attendance. For a single student we would want to know the ratio of:

$$\frac{\text{Years of Attainment}}{\text{Years of Schooling}}$$

If we were to sum these ratios over all pupils in a single school or a whole school district, as follows,

$$\sum_{i=1}^{N} \left(\frac{\text{Years of Attainment}}{\text{Years of Schooling}} \right) \Big/ N$$

we would have an average ratio of effectiveness in keeping attainment equal to time spent in school. These ratios could be converted to units of contribution to gross national product.

Another possible external measure might be derived from measures of earning power. According to 1964 Bureau of the Census figures, average annual earnings of people increase with greater amounts of education. On the average, the high school graduate earns more than the eighth grade graduate and the college graduate earns more than the high school graduate.

Given the figures for the increments in income associated with each successive year of schooling, and given the figures for the expected span of working or earning years, it should be possible to estimate average lifetime earnings associated with each successive year of schooling completed or--put in other words--the average contribution to the gross national product associated with each successive year of schooling completed.

This may be expressed mathematically as follows:

$$P_S = \frac{C_G}{C_S} \qquad (4)$$

where P_S is the productivity of the school, C_G is the predicted average contribution to the gross national product by a given pupil and C_S is the cost of providing the education to the pupil (defined as in eq. 3).

The value of C_G may be obtained as follows:

$$C_G = Y_S \, . \, I \, . \, Y_E \qquad (5)$$

where C_G is the contribution to the gross national product, Y_S is the years of schooling, I is the predicted annual income associated with the years of schooling, and Y_E is the predicted number of years of earning power.

One thing seems certain from our study: in American education today, too much is being spent too late. Colleges and universities are known to be crying for more instructors to conduct remedial courses for students not adequately prepared to pursue collegiate work with profit. High schools cry for the means of remedying what the elementary schools did not produce. And the elementary schools, caught in the semantic trap that "education" starts in the first grade, are crying for the means of remedying what the parents of the deprived children did not do. It may be that the school system must redefine itself and redefine when "education" begins. The most significant two advances in American education in the immediate future may be a concerted effort to make certain that the "child-pupil-student-scholar" is always ready for the next step, and an abandonment of the costly dependence upon remediation.

Operation Headstart has shown us the value of spending our educational dollar sooner, not later. It has also shown us the futility of spending sooner when the educational process that comes after Headstart is not ready to receive a much-improved product. If the cause and effect relationship were as evident in educational efforts as it is in the operation of an engine, our educational problems would be solved very quickly. As it is, we must tease out cause and effect slowly, and sometimes torturously.

The methodologies that have emerged from this study can be seen as tools immediately available to improve planning, the allocation of resources, the determination of needs and priorities and the definition and timing of those programs having the greatest potential. However, these tools must be used if the investment in this study by the U. S. Office of Education is to be fully exploited. Thus the real challenge lies in translating the recommendations of this study into action programs in public school districts throughout the United States.

APPENDIX A

MINORITY GROUPS AND TITLE I

> "The Negro has no room to make any substantial compromises, because his store of advantages is too small. He must press unrelentingly for quality integrated education, or his whole drive for freedom will be undermined by an absence of a most vital and indispensable element, namely learning."
>
> . . . Rev. Martin Luther King, Jr.

Contained herein is a consolidation of opinions gathered primarily from within the Negro community. From the intellectual Negro came philosophical statements about the condition of his race. From the businessman came comments primarily economically oriented. From Negro members of the educational community we heard demands for more Negro principals, for a closer contact with the decision-making processes of education, and for a fairer chance at promotional openings. The heads of community organizations and agencies told us about interference from the misinformed and the unimaginative, and about problems of their relationships with other agencies. The militant Negro questioned the sincerity of the white community--and of local, state, and federal governments--in their intentions toward the Negro. And from the inhabitant of the slum ghetto--expressed sometimes in words but often in silence--we felt a great degree of apathy, hostility, and depression.

Most existing efforts to reach the poverty-stricken populations of the slum ghettos have depended on the existence of one quality--some degree of compatibility with the standards of the middle-class white community. Either help was not forthcoming unless the recipient subscribed to those standards, or else the aid was structured in such a way that the recipient had to possess these characteristics in order to profit from it. From much that we have seen in the field, we can infer that Title I has had some success in escaping from this trap--that at its best, Title I has embodied a real effort to reach the target population on its own ground. Evidence for this inference is to be found in earlier sections of this document, specifically the section entitled "The Impact of Title I."

Unfortunately, the Negro's response to any particular program is colored by his general response to the conditions that surround him. What follows in this appendix is mostly the negative side of the picture. Sometimes it is self-contradictory; for instance, there exists within the Negro community--and sometimes even within single individuals--the notion that education for the Negro must be both separate and integrated. There exists the notion that white intentions are both sincere and insincere. There exists the belief that the South is--at one and the same time--both ahead of and behind the North on the path to true racial integration. We do not attempt to resolve these contradictions; we present them here because they exist. By the same token, we do not put forward the opinions quoted or paraphrased here as expressions of true facts, but as expressions of existing beliefs, which must be taken account of in any attempt to deal with the problems of the ghetto.

• • • • • • • • • • • • • • • • • •

On Education

Although outwardly most of the Negro intellectual community expresses a desire for integration, its primary concern is for quality education, integrated or not. The demand for quality education expresses, also, a general hostility to the white community's belief that Negroes are inferior. A common feeling seemed to be that "Negroes are down because they have been mistreated by the white community. First priority ought to be given to upgrading the Negro, because he has been cheated of so much. Constitutionally, we are to be treated equally, and we should be in the main stream of things. It is the responsibility of the government to give us a double dose of advantages so that we can catch up."

. . . .

Because of this feeling that so much is already owed to the Negro, Title I programs tended to lose a great deal of their impact. Only after long argument was it possible for the Negro to see Title I as a real improvement; more often, it was viewed simply as a long-needed remediation of a previously inadequate system--as bringing educational efforts for the ghetto child up to some minimal standard rather than improving them. Among those knowledgable about Title I, there was general agreement that public relations had been poor. The real intent of Title I had never been made clear to the community. The program needed much better information dissemination, the services of persons skilled in human relations, and the cooperation of all community service agencies.

. . . .

A significant segment of the Negro community believes that the white community strongly supports separate education, and that various plans for integration are met with hostility and are carried out negatively, without sincere effort or hope for their success.

. . . .

The most popular recommendation from the Negro community was that whites and females be removed from posts in the school system and replaced by retrained Negro males, especially in the upper grades. This would attack the most serious problem--the need to upgrade the Negro male image, which the Negro child, both male and female, desperately needs.

. . . .

Many Negroes in the field of education feel that they are not participating with any real influence at the decision-making level. They are always on committees, but they are never in a position to alter the course of events. "Always a runner, but never a winner."

. . . .

The primary reason that the Negro teacher feels threatened by the move up from below of teacher aides and other "volunteer" or "semi-professional" workers is that avenues above seem closed to the Negro teacher. Also, there is a certain degree of professional jealousy that says, "We came up the hard way, and now they're being given things on a silver platter. Where is ours?"

. . . .

In some cases, the Negro believes that evaluation of Title I programs has been less than honest. For instance, he may say that figures on total enrollment of Negroes in the schools were cited, though Negroes had not actually participated in the program in full. This strikes him as an attempt to create an illusion of success where it didn't exist, and to pass this false image "up the line."

. . . .

"More persons who have had successful direct involvement with the target community should be involved in the planning, implementing, supervising, and evaluating of Title I projects. Such persons should be given both responsibility and authority for program operation."

. . . .

Negro teachers feel a great need for the development of a merit system governing the promotion and selection of teachers, project heads, and other school administrators. Such a merit system would reduce the strength of a portion of the system that protects inadequate programs and mediocre personnel.

. . . .

"It would be a great tragedy if we awoke one morning to find that our society was in a state of complete equality and very cordial relationships among all people, but that the schools were still using textbooks written with a view to perpetuating a segregated society."

. . . .

It was often said that the school demonstrates little skill in intervening in the lives of the culturally disadvantaged for the simple reason that educators, by and large, are oriented to the standards of the existing middle-class power structure. By and large, they are inept at meeting the needs for growth and development of children who differ from these standards. In the North, much of the energy of civil rights groups has been directed toward the goal of "quality integrated education." But there is a real question whether such a goal can be reached without fundamental changes in the schools. Changes can only occur if the majority recognizes the danger to itself and its communities, and acts accordingly. Otherwise, reports and recommendations will come and go; the energy of protest will be turned into destructive, rather than constructive channels.

. . . .

"American education faces two great tasks: that of integrating the school now; and that of doing something about the pre-school life of the disadvantaged (Operation Headstart has demonstrated both the necessity and the great change for success from this approach). We may not be able to accomplish the second task until we have accomplished the first, but there is nothing to support the view that we must choose between the two."

. . . .

Both Negroes and whites recognize that the educational retardation of children in the public schools in deprived communities is cumulative. As these children become more and more retarded and are pushed from one grade to another without regard to whether they are, in fact, acquiring the academic tools essential for effective life, they become restless, unmanageable, overt discipline problems, or apathetic and withdrawn. Their motivation decreases and they leave school at the earliest opportunity. This perpetuates the cycle of educational, personal, and social inefficiency which dominates the life of the racial ghettos.

. . . .

(Many Negroes expressed the belief that educational problems are a direct function of an attitude prevailing at the level of the individual school, as can be seen in the following passage.)

Poor children, culturally deprived children, can learn if they are taught. Rejected children, disparaged children, cannot learn when the rejection and disparagement, flagrant or subtle, are reflected in the fact that they are not being taught. Furthermore, the fact that such a large percentage of minority children in the public schools across the country are retarded in reading and arithmetic cannot be logically explained as due to social and personal pathology. Not all of these children are from poor or broken homes. The tendency on the part of some educators (and others) to lump all children in a racial ghetto under the single heading of "culturally deprived" and therefore "uneducable" is an insidious form of stereotypic thinking and is a contemporary version of the earlier contention that Negroes are innately inferior. The educational effects of the arguments for cultural inferiority are the same as the earlier and more primitive assertions of racial inferiority. Both points of view lead to the development and implementation of educational procedures that stunt the ability of the child to learn. They both result in the self-fulfilling prophecy that he does not learn. If it is assumed that a child cannot learn, and if he is treated as if he cannot, he will not learn.

. . . .

"Color prejudice is the norm in American society, not an aberration. To accept this brutal fact may be the first step toward starting a dialogue within the educational profession that goes beyond speeches and lofty pronouncements."

. . . .

(From Negroes who believe most strongly in integration of education, we heard the following.)

Students are a product of their learning experiences. Those learning experiences should include interactions with people of various social, economic, and cultural backgrounds. You don't learn to swim by looking at a swimming pool, and you don't learn to understand people unless you associate with them. Learning is not confined to the instruction given within the four walls of the classroom. Children learn through eating lunch together, going on class trips together, preparing class projects together. There is no way that a teacher, no matter how excellent he is, can give a child the experience of dealing with children of another race unless those children are in the class with him and share his life there.

. . . .

"The Negro child learns less not because his mother doesn't subscribe to the Readers' Digest, and not because she doesn't give him crayons for this birthday, but because he is miseducated in segregated slum schools. Our dilemma is that we must somehow build a raceless society with the tools of a race-conscious world. It is important to think in terms of compensatory education for Negroes because they have been culturally deprived. But it is just as important to think of corrective education for whites, because the rudiments of white supremacy and racism and a distorted image of the Negro are still to be found in large elements of our population."

. . . .

(Finally, as is reflected in the following passage, one can sense an ominous pressure and sense of urgency that should not be ignored.)

A crucial aspect of the racial problem in the American public schools is the fact that the public schools have permitted themselves to become contaminated by the moral sickness of racism, which afflicts the larger society. They have permitted their procedures, programs, and practices to reflect the fact that in our society people who are perceived as lacking power are pushed around, ignored, excluded, or relegated to secondary status. American public schools have developed different standards of education and expectation for lower-status groups and thereby have been accessories to the reinforcement of a system of cruelty, injustice, and arbitrary rejection that spawns human casualties and social pathology. Specifically, the public schools in deprived communities have not only failed to maintain adequate educational standards but appear to have abdicated any concern with standards and are now producing functional illiterates. This process must be reversed. All of the rationalizations offered by school officials for the maintenance of this level of educational inefficiency must be challenged and rejected. This problem has now reached a point of imminent social and political crisis, if not catastrophe. The educational crisis in the public schools in deprived communities can no longer be approached or resolved in terms of "pilot projects" or "demonstrations." The present situation in the schools is one of massive inefficiency and requires massive and serious efforts. Such efforts must address themselves to the structural and functional reorganization of these schools. Anything short of a systematic reorganizational program will merely continue to perpetrate a cruel hoax on these children and their parents.

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On Relating to the Whole Society

"What is integration? Ideally, it is a state of mind. We must create a condition of the soul in which human recognition and appreciation would be mutually possible for all--both black and white."

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There is a general admission within the Negro community that many middleclass Negroes wear two faces; but this was generally regarded as a good thing. Negroes should be able to afford, and should learn to use, two faces--one public and one ethnically private. It was generally felt that "wearing two faces" had contributed in the past to the success of other minority ethnic groups in this country.

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To many Negroes, "white backlash" seems only a new name for an old phenomenon: white resistance to the acceptance of the Negro as a human being. Current civil rights legislation is being touted as the most comprehensive, revolutionary, and radical legislation that has ever been proposed. But its provisions are really nothing more than an expression of rights that all Americans other than Negroes have always taken for granted--the right to a job, the right to a house, the right to vote, the right to learn, the right to a hot dog at a five-and-ten-cent store, the right to go to any movie house, the right to use a library, the right to relieve hunger, or fatigue, or one's bladder, without fear of humiliation. These are all fundamentals. There is nothing revolutionary or complicated about rights such as these. That they are thought of as revolutionary is one of our difficulties.

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Within the hard-core, militant Negro community the vast federal programs are seen as a giant pacification effort--as bribes issued to quell, capture, and silence the Negro. From this, the militant Negro reasons that the attitude of the white man has not changed, but that the war in South-East Asia and other political developments have only caused him to develop specious approaches to solving the Negro problems in America (and related problems around the world). Essentially, many Negroes seem to feel both insulted and assaulted. They are, as well, confused as to what to do. The next step in their reasoning is: "Well, if they're just knifing us in the back, we'll knife them first."

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Among the more moderate Negroes, you don't hear this illogical chain of arguments, but even some moderates say that the programs, "although they aren't necessarily unwanted handouts, are poorly planned, disorganized, and mismanaged. If those programs represent the best the country can do when it comes to educating and upgrading the Negro, then we must either be sincerely frightened at this country's inadequacy and position in the world, we must run and hide, or we too must become as our brothers in the ghetto."

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"As Negroes have become bolder in demanding the removal of all vestiges of slavery that have kept them shackled, whites have also become bolder in insisting that those shackles not be removed. All that has happened is that both Negroes and whites have become more open and candid in revealing their true sentiments."

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(What is perhaps the core of the Negro dilemma is abstracted in the following frequently heard opinion.)

In the modern world, there is no substitute for the experience and responsibility of controlling one's own destiny, both as an individual and as a member of a community. One must have both experience and responsibility in order to make rational choices--to live in a world one feels competent to deal with. No one can gain this experience without the power of making decisions for himself, with his fellows, and with his local community. No amount of formal education or money can take the place of these basic life experiences.

. . . .

"One challenge the power structure does not accept is the challenge of working hand in hand with apparent opposition."

. . . .

Suppose you have a barrel of oil that is too heavy to lift or tilt, and you want to get some of the oil out of the barrel. One way is to pour water into the barrel and float the oil up to the top and over the edge. Unfortunately, if you keep this method up long enough, you will wind up with a barrel containing only water. Many Negroes look upon rehabilitation and assistance programs as analogous to this barrel-of-oil problem. They regard most welfare efforts as a device to steal from the Negro his traditional culture and replace it with a watery "white" substitute. Possibly a more viable way to enrich, expose, and teach may be to place less emphasis on taking away "undesirable" habits and more emphasis on adding "desirable" qualities. In speaking with many persons deep in the slum ghetto, we found a common response to federal programs to be "O. K., if I accept the water you're pouring in my barrel, at least extend me the courtesy of taking a look at the oil you're pouring out. You might find you want to do something with it other than dump it along the way."

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On the South

Whenever Southern liberals--black and white--gather to discuss the question of integration, someone inevitably introduces a grand vision of the future. The South, runs the argument, will shortly catch up and pass the rest of the nation in the thoroughness of its racial integration, for in the South whites and Negroes are not strangers. They are both products of the same subculture; they share a common history and a common religion. White and Negro Northerners often share neither. Nor, it is said, is intimate interracial contact anything new for the South, as it is for the North. Consequently, the giant step from formal desegregation to informal integration should take place in the South with great swiftness.

The Southern liberal vision of the future should give pause to champions of integrated education in the South, for it is not without merit. There are, however, a few cantankerous flies in the ointment. Southerners have been watching the ways in which Yankees manage their race problems, and the new strategies of Southern segregationists have an unpleasant familiarity to any Northerner enmeshed in the struggle to overcome de facto segregation. Token school desegregation in the South is not just a foot-dragging device; its greater danger lies in the possibility that it will be converted into a condition of de facto segregation modeled directly after the Northern situation. Southern moderates have argued that the South needed time to comply with federal demands for integration, but the time granted has not led to good faith or to the resolution of real problems. Rather, the years have been used to erect racial barriers closely resembling those in New York, Chicago, Detroit, and Boston. Years ago it was fashionable to point out that racial segregation was not just a Southern but a national concern. Now it can be just as truthfully said that de facto segregation is not just a Northern concern.

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Americans who work for integrated education in the North should realize the broader significance of their efforts. Housing segregation, special transfer provisions, and job discrimination in the North have provided a negative model for Southern segregationists. So too, candid destruction of these same barriers can serve as a positive model for Southern integrationists.

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On Living in a Ghetto

For the most part, you will find that the person in the ghetto is psychologically unaware that his plight is as bad as others would have him believe. It seems that the nature of man protects him from himself. Even the poorest and most deprived enjoy something in life. The number of those in the ghetto who view their condition as the white community views it is very small. Outsiders view these people as uneducated, uninformed, misguided, irresponsible, incapable of managing their affairs, and are attempting to make positive changes. They point to "reforms" that are occurring because of their efforts, but most of the time they are deluding themselves. The parolee hasn't stopped carrying a gun because his character has changed, but only because he is being watched. The unwed mother must watch out for the case worker who can take her off welfare, but she doesn't stop having sexual relationships or change her views on having children--she only becomes more circumspect. These examples demonstrate a basic flaw in the approach of most welfare efforts--the changes don't come from an effort to change oneself, but only from an effort to meet some outside standard; in time, as fear diminishes and reinforcement does not occur, the forbidden act happens anyway.

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The resources available from within the ghetto are, in fact, greater than might be supposed. But in many respects the ghetto resembles a Darwinian jungle, engaged in a struggle for the survival of the fittest, and for the most part this compeition works negatively. Time and again, agencies competing for various funds cut off and shut out their counterparts. An agency that receives a tidbit of support does not solicit the help of its sister agencies. If qualified personnel are not available within an organization that has received funds, there is no course of action that allows it to call on other resources existing within the ghetto. Agencies that do not receive funds stand in the shadows waiting for the downfall of funded but unstaffed agencies, so that they will get the next opportunity. Agencies that do get funds set out to destroy weaker ones--a kind of "preventive maintenance." One agency may raid the personnel of another (thinking to destroy it) only to find that the new staff members have remained loyal to their former organization and have worked from within to hamper operations and clog the wheels. (Many political campaigns and poverty programs have failed because of actions like these.)

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Everyone--both white and Negro--seems to agree that there is an appreciable difference between the "middle-class" Negro and his lower-class brother. What is not generally recognized is that there are at least two clearly separable Negro "middle-classes." Some Negroes, economically middle class, have retained an identification with the ghetto even after having gone away to college, gotten a middle-class job, or otherwise "escaped" from the ghetto milieu. There is little love lost between these people and the "traditional" middle-class Negro, who, in coming up from the ghetto, chose to identify with the white race. Often, members of the "traditional" Negro middle class have remained uninvolved in the overall struggle for Negro civil rights. The differences between these two middle-classes are deep-rooted, and strongly affect the personal orientation and psychology of individuals in both groups. These differences are reflected in--but go far beyond--the current meaning of the term "Uncle Tom." When breakthroughs in civil rights come, members of the "traditional" Negro middle class--because they are already in the "in group," or because they are more easily accepted by whites--are often placed in charge of various programs directed at the lower-class ghetto Negro. In truth, these Negroes know very little about ghetto problems. They are "black Anglo-Saxons," with only skin color distinguishing them from the middle class white person.

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"The effects of deprivation are inherent in the cultural and social system. The individual child cannot be understood or helped without altering the system--which is difficult--or removing him from it--which may be both unethical and emotionally disastrous."

. . . .

To the inhabitant of a ghetto, the law officer, the store owner, and others who come from outside the ghetto and try to function within it are the only visible exemplars of the way whites treat slum people. The negative assumption is immediately made about the ghetto-dweller if he fits the usual socio-economic image; if he isn't well-dressed, clean-shaven, articulate, and well-mannered (logical middle-class characteristics) he is assumed to be up to no good.

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The need for, and the sense of, human dignity exists in everyone. That one man's idea of "human dignity" takes an unlikely form, or differs from conventional notions, does not alter that. From the slum-dweller's point of view, the problem with many federal rehabilitation programs and other social welfare programs is that they run counter to this psychological truth. A person will discuss his "faults" with his closest friends; he may even be willing to discuss his problems with a total strange whom he thinks he will never see again. He is unlikely to admit his real problems to a social worker. Even more, he is likely to resent having to accept certain kinds of public aid; "Man, you gits anything from the Welfare, you gotta swear you a no-good bum. You wanna keep on gittin' it, you gotta swear you stay that way!" Surely, programs that brought assistance into the home quietly and privately would have a greater chance of success than those requiring a public confrontation between the individual and his problems.

APPENDIX B

MANDATE TO JOY: THE NOTEBOOK OF A TEMPORARY MUSIC SUPERVISOR

PRELIMINARIES:

Assistant Superintendent: We want the sound of music in the air. We don't want anything cut-and-dried this summer.

Elementary supervisor nods beautiful head.

Uncertain potential temporary music supervisor, thinking:

> Hmm. The sound of music ! Well, if boredom with routine, frustration at the head against the wall - - if these qualify, then I'm all right for the job.
>
> (Mercifully we will pass over period of panic and doubt. UPTMS is "out-of-field," no status with state department. Has sinfully learned things on own. Decides to give up and return to field of paper qualification. Senility approaching. No time to spend, like the rest of her life, in by-ways. Must get on the beaten race-track toward success.)
>
> But these little children need the sound of music. And TMS needs cash. Will try.

PREPARATION:

TMS rummages through musty files from her past. Finds materials long forgotten and idealistic quotations from speeches to P. T. A.'s and equivalents:

> Everything was wonder at the start -- the alphabet, the multiplication tables. A good teacher has to keep this sense of wonder, re-make it day by day, bring things to life. Dull teaching respects neither the dignity of the child nor the importance of the subject matter.
>
> I read somewhere that education is not the filling of a cup but the lighting of a spark. That isn't right. I want the cup full. I want the curriculum varied and rich. But the child has to give back, has to re-express the things he learns or they are not really his. That's where the arts come in. They energize.
>
> The word "creativity" embarrasses me. It simply means respecting the child's imagination, his right to his own ideas. The peak of creativity to me is a verbal thing: a true thought clearly expressed. But language is so complex!

> Beyond the powers of children. Often a child can express first with movement, color, sound and pantomime things that he later learns to say.
>
> All schools should have full programs of creative arts, not bound within its own avenues, but touching the curriculum at every point, adding richness, depth, and joy to the subject matter.
>
> Huck Finn said his victuals weren't good until the juices got mixed up in the barrel. I think the arts and the academic subjects are like that; lots better with their juices mixed.

And on and on and on.

TMS amazed to discover that she still believes. Can't decide when the rigor mortis set in in her own teaching. Dust flies. Gets excited.

VISITING SCHOOLS; MEETING PRINCIPALS:

Fun. New friends. Some schools bright, clean, and colorful, receptive of joy. Shreds of idealism show through with some principals. Quotations:

> The children come to school, and they come clean. The P. T. A. -- it doesn't raise much money, but it supports the things we try to do. We want to build their self-respect.
>
> Better give these kids some fun! They're human. They'll drop out. Nobody makes them come this summer.
>
> Bet your life you can use it! This school and everything in it is for the use of the children. Help yourself!

T. M. S. Can't wait to see the children.

TWO DAYS OF WORKSHOPS:

Teachers cordial, friendly. TMS gives famous mandate. Notable relaxation. But how teach joy?

T. M. S. draws out responses, discussions, some argument. Fun. Sparks lighted.

Some nervousness over horrible word, creativity. Decide it is by-product, should not be directly pursued. It's the flower on the rose-bush of intelligent and imaginative teaching. Prepare soil. Keep watch. Invite but do not force.

Attention to music's own subject matter necessary. Concentrated listening (fight the "back-ground music" evil!) Always listen for something. Then get in the act. Move. Play instruments. Dramatize moods, etc. Then -- and don't you forget it! -- attach the academic learnings and skills. Teach them the symbols for what they have experienced. It must begin with play and feel like play, but the play must lead to learning.

Court contact with teachers of other subjects, particularly language arts. Group teaching ought to work to the advantage of all.

Bring the best music, live, to the children. Community abounds with opportunities, ours for the asking.

Discussion continues. Education-department teacher: But, how shall we evaluate?

Evaluate. Long moment of silence. T. M. S. in deep water.

> By the light in a child's eye, I guess. By a smile. By the relaxation of his body. By his willingness to share, to give-and-take, to appreciate -- by ----

Eloquent summary by someone to the rescue: You can't evaluate what really matters!

Down to business. Study of materials. Singing. Playing. Dancing with shoes off. All avenues to friendliness.

Suggestion for weekly meetings in each other's schools, all to bring and share techniques and secrets.

GETTING STARTED:

TMS flies about trying to remove material obstacles to joyful teaching. Can't remove greatest one, the heat.

Things start to roll.

FIRST MEETING:

Lunch together. Show-and-tell. New materials.

Discussion of discipline: Confusing. Does it conflict with recommended freedom? Some children climbing walls.

A strongly disciplined permissiveness arrived at as ideal. Very strong lines of control preventing waste of time and dissipation of energy (also preserving sanity of teacher) and within these firm lines, freedom. Chaos is wasteful, irresponsible, unfair to children.

SECOND MEETING:

Progress to report. Lunch, concert of children, demonstration of audio-visual equipment. TMS learns much.

Introduction of new rhythm manual and records. Aim is ease and grace of movement, motivated always by musical values. Does not duplicate phys. ed.

THIRD MEETING:

Lunch by PTA. Principal's novel idea: Teachers are human beings. They should be fed.

Demonstration of beautiful free movement by children, interpretation of Handel music. Movement suggested by color and pattern of art, by words. Then patterned movement, folk dances of other countries.

Discussion of voice. Inaccurate singing and raucous quality noted. Also the most outstanding potential for beauty. Exciting discussion of social factors affecting taste and tone of children. Appropriate attitudes to preserve respect for their own heritage yet broaden musical experience.

PROFESSIONAL MUSICIANS PLAY FOR CHILDREN:

In two schools. Mozart, Debussy, Milhaud. Pin-drop appreciation. Good manners. Elation of players. Beg privilege to come again.

EVALUATION:

TMS remembers that word. Gives out questionnaires to teachers.

First returned written with frozen pencil points. Decides on interviews. Results:

Results:

1. I've liked the emphasis on freshness of ideas. Don't do it the same old way, same old 7 and 6. The notes are the same, the ends are the same, but let's find new approaches.
   I am amazed at the exuberance of the children. It's marvelous! In these small classes they can all do things, touch the bells and the piano and all the instruments. I have been able to work with every child. It is almost Utopian teaching.

2. The weakness is the time limit, the short half-hours. I'd like a longer period, to get in singing, moving, listening.
   I wish we'd been able to do team teaching. Like always, everybody was busy pushing his own subject. I wish we could plan together. I'd love to finger-paint to music, for instance. Perhaps we can do this another year.
   I'm impressed with the material, the human material, we have to work with. These kids are willing to spend half a day, no matter what the weather, doing creative work. They are so eager! (I guess the ones who weren't dropped out.)
   In the winter our course of study binds us down. We've felt so much freer, uninhibited, teachers and students alike.
   The underprivileged child -- did you ever think of this? -- is used to improvising. He improvises the necessities of his life, what he will eat, what he will wear to school. We have used this natural ability to improvise this summer and built upon it, I think, found patterns in it , and guided him through it.
   We have been schedule bound. This freedom has been enjoyable.

3. A new teacher: I could not move as fast as I wanted to. I had to drill longer than I liked. I thought the singing was terrible at first, but it's so much better now. And movement -- they all just stood around and looked at each other. Now they love it. They do their own ways.

   There hasn't been any team teaching though, and I was disappointed. I heard all about it in college and I'm all for it!

   I've loved those teachers' meetings with everybody talking about the work. Those teachers know so much! This has helped me.

4. I like the freedom and the informality. We taught at high pitch of emotion most of the time. But also we have shown

that music is soothing, that lying on the floor and listening is an aspect of music learning too.

I wish an overall plan, basic, yet flexible enough not to bind us down could be decided on long before summer. I would like team teaching.

5. A high-school teacher:

This summer has changed my outlook toward music teaching. I wish that the spirit of enjoyment could be continued in the academic year. But not omitting academic disciplines! This free work should lead toward discipline. I am always concerned about the fundamentals of music.

6. This free work makes the children listen. I wish you could have seen the Shostakovich polka just now. They heard the different sections. They understood the form.

They love the dancing. But when I turn to the reading charts they don't say, "Oh no!" they way they used to. They pick it up in the same spirit.

I know the children better through this music. A classroom teacher warned me that a certain child wasn't all there, not to expect anything from him. Why that child is bright -- is bright as a spot, a part of everything. I wish I could go on teaching like this forever.

7. Young teacher in school of a different race:

I was a little afraid of this job. But people have been so nice to me. I'm downright spoiled. I'm not used to being helped and looked after.

I often think, if this situation were turned around and a teacher from another race came to my school, would we be as nice as people have been to me.

It's been a wonderful experience. I'm going to be such a good teacher next year!

8. Fine teacher of long experience:

This has been experimental. Now we understand our needs. The children need so much more individual attention. I hope this carries on into the winter.

Here are the good things: Attitudes have been wonderful. Teachers are happy, willing to dig in. For the first time we know one another. There is a closer feeling.

From now on, I will know friends to call on for help and inspiration when I need them. The way Betsy blossoms when she talks about her theory! The beautiful piano-playing of Mrs. Barden and her wealth of knowledge!

Music is such a large subject. None of us can be equally good in all aspects of it. We have had a chance to appreciate one another this summer. What we can do together is so much more than what we can do alone.

Here are the bad things: Team teaching did not work, and I thought it was our main project, the point of the workshops. If we had a workshop day for team-planning, it might help. We could plan our subject matter together and support one another.

Our work is not understood. It needs a spokesman. People pass our door and think we're playing. We're the happy, good-time folks. That is the nature of our work. They do not understand the strain of giving happiness, excitement all day long.

We need someone who symbolizes music to explain our broader aims. And we need to keep in touch with other teachers' aims. That's why I want closer cooperation in the teams.

The children aren't the only ones who need to improve communication.

9. A real professional:

We've done exactly what Mr. Phillips wanted and nobody knew he was doing it. The children have had a part in planning things, a say in choosing what to do, and then we've sneaked in skills and learnings.

They've learned a lot without feeling taught.

10, 11. Two classroom teachers teaching music:

Don't know if the children have learned. Believe me, _I_ have. And I get A-plus on effort, I tell you!

I'm so carried away with this whole thing that my husband and I bought ice-cream for the school.

TMS's PERSONAL APPRAISAL:

Faith-inspiring, humanizing experience. Appreciate outstanding potential of teachers. Believe them professionally lonely, in need of understanding, appreciation, meaningful contacts among themselves and with their administrators.

Children like all children- - hope of world. Good, bad, ornery, charming, funny. Important.

Strange coincidence: TMS read paragraph in Agee's book night before workshops began:

> In every child who is born, under no matter what circumstances and of no matter what parents, the potentiality of the human race is born again: and in him too once more, and in each of us, our terrific responsibility towards human life; towards the utmost idea of goodness, of the horror of error, and of God.

Goes on to say what schools and school administration on the whole do not respect this trust, that education sometimes seems "the very property of the world's misunderstanding," "the sharpest of its spearheads in the brain."

Believe he would have been heartened by this summer's sessions.